SPARKLE

Bishan Park Secondary School

Professional Learning Teams

SPARKLE

A Publication by Bishan Park Secondary School
Ministry of Education, Singapore

CONTENTS

Principal's Foreword 04

Messages by Lead Teachers 06

A Poem for Professional Learning - A Palatable Lesson Course
Bhavana Thiagarajan, Geraldine Cheng Siew Yee 08

Professional Learning Team Projects

English Language

Enthusing Reading, and the Teaching and Assessment of Reading Aloud Skills
Bhavana Thiagarajan, Geraldine Cheng Siew Yee, Gnana Yesudial G Abraham, Diana Chua May Ling 09

Assessment of Photography and Language Skills in the Production of a Photo Essay
Noelene Liew Oi-Yin, Kavitha Kanniah, Muthu-Ramasamy Amirtham Ammal, Lee Sau Foon 15

Mother Tongue Language

Enhancing the Learning of MTL Through the Use of Commercial Advertising
Nurul Syakinah Sahak, Djohan Abdul Rahman 22

Mathematics

Developing Students' Thinking Process Skills in Solving Real-World Problems
Kumari Shanker, Chua Weilin, Nai Chheu Yee, Khet-Hoo Yiin Hwa 28

Science

Developing Scientific Thinking Skills Through Argumentation Approach Based on SOLO Taxonomy and 4 Levels of Feedback
Lim Si Ting, Annie Tan Yew Geok, Hsu Lay Keok, Mario Chua Chong Yi 34

Social Studies

Enhancing Understanding of a Social Studies (SS) Issue Through Use of Debate
Noorfatin Beevi Abdul Aziz, Linda Wee-Soh Suay Hung 40

Geography

Enabling Self-Assessment Using Writing Frames Augmented With Performance Rubrics Anchored on SOLO Taxonomy
Stephanie Lee-Chew Li Ling, Alice Yeo Ai Lee, Geraldine Chong Li Hoon, Cheng Ai Hoon, Jan Mak Wenling 46

History

Enhancing Inference Skills Through Peer Assessment
Jason Seng Yang Sun, Tan Wei Nah 52

Craft and Technology

Active Learning Through ICT-Enriched Lessons Assessed Using SOLO Taxonomy
Ng Joon Yong, Chan Jie Yong, Pooja Sahu, Chanel Kang Yiling, Arion Lai Jia Hui..... 59

Physical Education

Holistic Outdoor Education Through The Place-Based Learning Approach
Kelvin Chong Chee Leong, Adam Liew Yee Hoong, Tan Chee Beng, Lawrence Lim Boon Huat..... 66

Character and Citizenship Education

Using Rubrics Guided by SOLO to Enhance Relationship Management
Wong Hei Man, Alice Yeo Ai Lee, Jason Seng Yang Sun..... 73

Teach-Bits (Bi-Weekly Publication from the Senior Mentor Council)

Volume 1: The Four Levels of Feedback and Its Timing
Ng Joon Yong..... 78

Volume 2: The Effectiveness of Positive and Negative Feedback at the Self/Personal and Task Level
Terrence Ong Yong Wee..... 79

Volume 3: The Effectiveness of Positive and Negative Feedback at the Self-Regulated Level
Djohan Abdul Rahman..... 80

Volume 4: The Positive Teacher-Student Relationship
Kavitha Kanniah..... 81

Volume 5: The Factors that Influence How Students Will Respond to Our Feedback
Linda Wee-Soh Suay Hung..... 82

Editorial Team 83

Principal's Foreword

This year the theme for the Staff Sharing Day is *Sparkle*. It encapsulates the vision of *shine* and *glitter* in our professional development journey where our "white spaces" are decorated with sparkling brilliant ideas. Indeed, this journey of learning started in Dec 2016 as we experimented with our version of the SOLO (Structured Observed Learning Outcomes) Taxonomy and the Four Levels of Feedback on our trip to Shatec, making Diablo Coffee and mayonnaise, immersing in the joy of learning. We played the role of students then, listening keenly to how we gave each other feedback to improve our gastronomic attempts. The collaborative learning was strong and the camaraderie was remarkable amongst colleagues.

In early Jan 2017, the various departments came together with admirable efficiency and organisation to get started on what they have learnt and brought the learning into the classrooms. A total of eleven professional learning teams were formed and each team went deeply into their disciplinarity to determine innovatively how the intervention strategies would look like for their students. In each project, the teams actively engaged the students to construct and co-construct knowledge in the classrooms, keenly developing thinking skills and dispositions that ignite learning in our learners. These projects are put together in a publication entitled ***Sparkle***. It documents the sparkles of learning that come from diverse academic subjects and topics through the use of varied strategies such as the active learning process, use of rubrics, use of writing frames, performance tasks, place-based learning, argumentation-driven dialogues, cooperative learning and use of profiling tools like social emotional competency inventory, all augmented by the use of the SOLO Taxonomy. This publication is epitomised by steadfastness in our beliefs and painstaking hard work, and embodied by dedication and professionalism. A publication for teachers by BPSS teachers has finally arrived! It is heartening to see how learning has become so part of us. Indeed, *man's or woman's mind, once stretched by a new idea, never regains its original dimensions* – Oliver Wendell Holmes(Jr).

But how did we do this? In the business of the day-to-day operations, teachers ploughed through voluminous literature reviews to establish and define their practice research areas, documenting their teaching approaches fastidiously, and using assessment data to redesign and regulate the interventions so as to address the learning gaps better. Concurrently, they negotiated their busy day in school with big hearts, showed care and concern for the students or conducted home visits if there was a need to do one. The teachers' care and tenacity in

their work through their persevering assertiveness to take the child to the next level, anchoring on the belief "Every child wants to and can learn" is most admirable and it touches my heart deeply. I salute you, my dear teachers.

A special thank you to all the authors and colleagues who have devoted enormous efforts to make this publication a possibility for us all. Let this publication be in our repository of beautiful memories, remembering ourselves laughing and learning together. The joy of learning is always there for the brave and resilient ones!

Let's ✳ **SPARKLE** ✳ together on Teachers' Day to celebrate our achievements!

Mdm Valerie Goh Mien Hui
Principal
Bishan Park Secondary School

Message from Mr Djohan Bin Abdul Rahman

Lead Teacher (Malay Language)
Recipient of President's Award for Teachers 2017
Chairperson, Senior Mentor Council

Teachers from Bishan Park Secondary School have always prided themselves as reflective practitioners who will always strive for innovative excellence. Since 2011, the annual Staff Sharing Day have revolved around projects developed by the department-based Professional Learning Teams (PLTs), which brought about an abundance of varied teaching strategies and approaches, aimed at elevating the students' level of learning holistically.

The year 2017 is no different. The various PLTs embarked on their respective journeys to find innovative and meaningful discoveries to deepen the students' learning experience. This year, the teachers deepened their learning by engaging various pedagogical practices based on the SOLO Taxonomy and the use of effective feedback to make lessons more meaningful for their students.

It was very heart-warming to see the strong collaborative culture of the teachers despite the busy work schedules, teachers come together to support one another, developing ourselves professionally. The publication of Sparkle is a strong testament of our teachers' commitment to professional development and the mission to nurture every child to their best potential.

May we, as educators, continue to Lead, Care and Inspire others to *Sparkle* bright ideas so our students may become good and contributing citizens of tomorrow.

Message from Mrs Linda Wee-Soh Suay Hung

Lead Teacher (Social Studies)
Vice Chairperson, Senior Mentor Council

It is my pleasure to present to you *Sparkle*, a BPS publication, showcasing the collaborative effort of the Senior Mentor Council (SMC) and 11 Professional Learning Teams (PLTs).

To face a VUCA world, students need to possess not only knowledge but also critical thinking and inventive skills to navigate a complex world. Teachers in turn need to take up new roles as facilitators of knowledge and develop in students the ability to inquire, analyse, innovate and create knowledge. Teachers themselves need to be innovators to develop the best pedagogies to impart these new skills and competencies. In BPS, the SMC drives staff professional development and promotes a culture of professional learning community in which staff work collaboratively to innovate and enhance their pedagogical knowledge and skills. In this book, 11 PLTs share their innovative lesson packages as products of their successful team effort. These lesson packages were created incorporating assessment literacy knowledge of SOLO Taxonomy and Levels of Feedback as well as ICT knowledge of Google Site. They provide insights on how creative ideas are put into practice to enhance teaching and learning and develop students as thinkers and creators of knowledge.

I would like to commend the PLTs for their dedicated effort and congratulate them for their publications. I am sure many educators will benefit from the creative and interesting ideas of your lesson packages.

May *Sparkle* ignite sparkles in your love for teaching and learning!

A Sparkly Cuisine by Literature Teachers

Bhavana Thiagarajan, Geraldine Cheng Siew Yee

A Palatable Lesson Course

To create a chef d'oeuvre is no easy feat,
But if brought to perfect culmination, it can be quite the treat.
Before one begins to create magic,
The PLT needs to be prepped.
An environment that sparkles, certainly must be met!

Success criteria sharpened,
SOLO rubrics neatly laid out,
Sequencing key questions all lined up,
as with syllabus doc, exam papers, and a copy backed-up.
Feedback is infused with robust reasoning,
Critical thinking – a necessary seasoning.

The dish is best served with warm consideration
Marinated ideas given months' formation
Flavours honed to cater to differentiated instruction
Assessment prepared with right intention
So much to do for one to savour
And so begins the orchestrating of flavours…

With great love and care,
Stir these ingredients into the mix:
A fillet of ingenuity,
A cut of inspiration,
A wedge of inventiveness,
And a dash of finesse for the joy of learning.

Ignite the sparks of creativity
Arouse the flames of curiosity –
Bring the passion to a boil
Then garnish it after such toil
Or even drizzle a little midnight oil

But the chef's job is not yet done –
After the last morsels have been scrapped clean,
Constant refinement is part of the routine
Till this dish can be dubbed a cordon bleu cuisine!

Enthusing Reading, and the Teaching and Assessment of Reading Aloud Skills

Bhavana Thiagarajan
Geraldine Cheng Siew Yee
Gnana Yesudial G Abraham
Diana Chua May Ling
(English Language Department)

Abstract

Reading has lost popularity among people especially school-going teenagers. Many students prefer trendier pastimes and often spend an enormous amount of time on online games and social media platforms. While teachers are aware of the negative impact of students not reading, they also understand that cultivating the good old habit of reading in our young learners is an uphill task. Our PLT took up the challenge and explored ways to enthuse reading via the organisation of interesting reading-related activities and showcasing them on an online platform for all to access and learn from one another. The team also used the SOLO Taxonomy to plan lessons that facilitate the explicit teaching of reading aloud skills to the students in order of complexity. The SOLO Taxonomy was also used to develop a rubric for assessment, which facilitated feedback given to the students to improve their reading aloud skills. This has potential to impact the students' performance in Paper 4, the reading aloud component, of the English Language paper.

Introduction

It is common to note that people read less these days owing to the advent of modern technology that brings about entertainment or leisure alternatives that draw them away from traditional reading. Reading is no longer the "go to" pastime as people can easily catch a show, play online games or entertain themselves with gossipy newsfeeds on social media platforms. This trend has resulted in our students not reading sufficiently these days. It does not help that the school curriculum is tight too, which leaves no time set aside to enthuse or encourage them to read more, and read widely.

The 2010 English Language syllabus recognised the need to enthuse and engage our students in reading too. It emphasises the use of rich texts in the teaching of reading skills as well as comprehension assessment. Despite the varied modality of reading comprehension expected – visual, narrative and informative texts – the emphasis on teaching and using language for impact remains. However, it is a real struggle to teach our students to appreciate the nuances of language when they hardly read beyond their textbooks today.

The emphasis on Literature and ensuring that the skills learnt are aligned with the English Language is one way many teachers adopt to circumvent this problem. However, this solution is still limited to curriculum time. We need a strategy that cultivates the interest in our students to read beyond the classroom.

Literature Review

Research has shown that having the ability to do reading aloud and silent reading are important. Reading aloud trains one's articulation and pronunciation as the focus is on sound, whereas silent reading trains one's comprehension skills, thus improving a person's inference skills in the long run. Thus, by getting our students interested in reading, we are not only helping them with their English Language examination, but also imparting important life skills subsequently.

Silent reading assists the reader to create mental pictures of the text being read and thus enhances comprehension. It also helps the reader to develop the skills of reading for a purpose since the focus is predominantly on comprehending the content; the reader is relieved of the additional burden of paying attention to pronunciation. As such, the reader is able to sustain his concentration on the text and 'absorb ideas into their subconscious mind'. (Billah, 2015)

Research has also demonstrated that reading aloud / expressive reading supports fluency and comprehension. If the reader is able to read in an expressive and meaningful manner, he successfully constructs meaning and understands the text. However, linguistically weaker students who struggle with reading may find the task tedious and unrewarding, and hence lack the motivation to rehearse reading for perfection. To tackle this motivational issue, it is suggested that students be given an outcome to achieve, such as, the need to perform a reading in front of a target audience. Readers' Theatre, a form of expressive reading, comes in useful here as it offers a platform for the readers to practise and perform texts for an identified audience.

Studies have provided evidence that the repetitive reading practice necessary for Readers Theatre is a major factor that influences fluency improvement. It also offers opportunities for readers to model after good oral reading. As Readers' Theatre provides the readers an authentic purpose by allowing them to perform their reading in front of a target audience, the readers are more motivated to read their scripts repetitively during practice. Overall, Readers'

Theatre has been shown to be 'an authentic, engaging, and motivating, fluency tool for all involved'. (Vogan, 2013)

Methodology

The Reading Programme in Bishan Park Secondary School engages the students, Secondary 2, 3, 4 and 5, in weekly reading during morning assembly. The school conducted a survey and collated a list of young adult titles that these teenagers enjoy reading. The books were purchased and distributed to the students for reading during this programme. The students are encouraged to exchange their books when they are done with theirs. To encourage the students to read on their own, the English Language teachers engage them in reading-related activities, such as, bookmark-making competitions, book reviews in both print and videos, and other fun activities that revolve around their reading titles. A Reading Programme Google site is also set up to showcase these activities to the student body – it is a platform for the students to review their own work and garner feedback from their peers and/or teachers.

The long-term goal of this programme is to enthuse our students in reading and inspire them to be lifelong readers, which will consequently bring about a positive impact on their language skills. For this Professional Learning Team (PLT), we focus on a short-term goal, which is to raise awareness of good reading aloud (expressive reading) skills and teach our students how to do so explicitly. We chose the platform, Readers' Theatre, where the reader uses the vocal expressions to tell a story sans the use of visuals, costumes, sound effects and so on to help him/her achieve his/her goal. Improving their reading aloud skills will not only help our students do better in the oral component of the exam, it will also make them better engaging speakers as they are able to harness vocal and tonal variation for impact.

To train and prepare our students for Readers' Theatre, our PLT analysed the various skills set required and used the Structure of Observed Learning Outcomes (SOLO) Taxonomy to help us classify and plan our lessons such that the skills set are taught to the students in increasing order of complexity. The SOLO Taxonomy (Biggs, 2013) also helps us develop a rubric for assessment by classifying the learning outcomes in terms of levels of increasing complexity. This enables us to assess the quality of the students' reading aloud (Readers' Theatre performance). Annex A depicts the rubric for the assessment of Readers' Theatre. We piloted this Readers' Theatre training and assessment on Secondary 2 Express students.

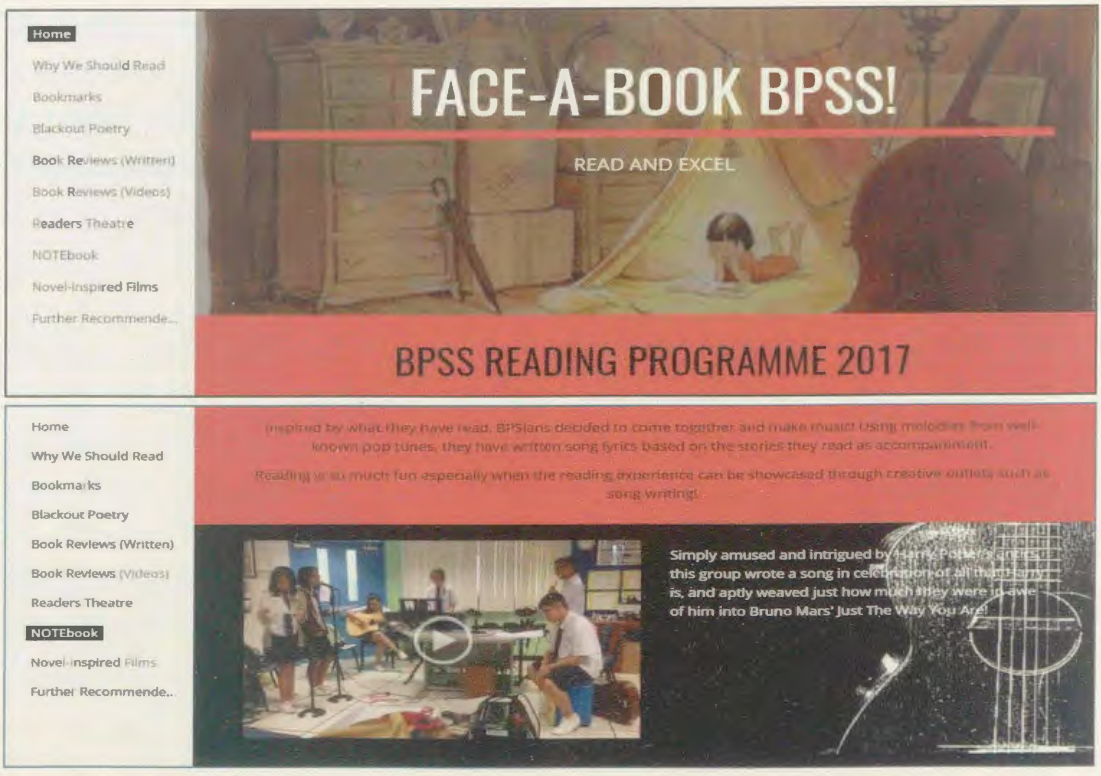
To this end, we conducted theory and practical exercises on map reading, taught our students learning outcomes.

Results and Discussion

The Reading Programme Google site (URL: https://tinyurl.com/bpssreadingprog) is not only visually appealing but is also a magnet that draws avid readers together. The Reader's Creed spells out proudly what proper and good reading entails and the students' work showcased, such as book marks and book reviews in print and videos, serve to provide useful synopses for fellow readers, enthusing them to pick up titles that they have not read.

The PLT is also glad that we embarked on our SOLO journey, for we managed to break down the complex mastery of good reading aloud into set skills (uni- and multi-structural levels), and plan to teach our students to master these skills at the relational level so that they can skilfully amalgamate these skills to produce good reading. The extended abstract level offers the scope to develop the reading skills of higher-ability students, allowing them to incorporate aspects of speech and drama to further enhance their reading.

The SOLO rubric also facilitated teachers' feedback to the students for improvement. The rubric allows the teachers to pinpoint very specifically the area(s) for improvement (task and process feedback) and also equip higher-ability learners with self-regulatory feedback, cultivating self-directedness in them.



Snapshots of the Reading Programme Google Site

Conclusion

The fruits of a successful reading programme take time to bear. The positive impact of reading may also manifest in many forms and does not translate directly and necessarily into an improved academic performance. Hence, we are unable to find any significant impact on the students' English Language performance through tests and exams. However, enthusiasm in reading among selected student pockets is evident and this can be seen from the students' work showcased on the Reading Programme Google Site. Though we have yet to garner data that reflect the students' improvement in reading aloud skills, a survey with English Language teachers has revealed that they are now better at guiding, facilitating and providing different levels of feedback that guide the students' mastery of good reading skills. Though the PLT has wrapped up the project for this academic year, this project offers scope for future experimentation on the impact of reading on the students' acquisition of skills to comprehend and apply language for impact.

References

Billah, M. (2015). Significance of Silent Reading - The Independent Online. Retrieved from http://www.theindependentbd.com/magazine/details/8098/Significance-of-Silent-Reading

Vogan K. L. (2013). What research says about readers' theater and the impact on first through eighth graders' oral reading fluency. Retrieved from https://dspace.sunyconnect.suny.edu/bitstream/handle/1951/63057/Kaleigh_Vogan_Masters_Project_May2013.pdf?seq

Annex A: Readers' Theatre - Assessment Rubric

Skills	Pre- Structural (0 marks)	Uni-Structural (1-2 marks)	Multi-Structural (3 to 5 marks)	Relational (6 to 8 marks)	Extended Abstract (9 to 10 marks)
Pronunciation and Articulation	Many words are wrongly pronounced.	Able to pronounce most words.	Generally accurate pronunciation of words.	Pronunciation of words is mostly accurate.	Pronunciation is accurate and crisp.
		Attempts to pronounce end-consonants (word endings).	Inconsistent attempts to pronounce end-consonants, 'th' consonant, vowels and diphthongs.	Occasional slips in attempts pronounce end-consonants, 'th' consonants, vowels and diphthongs.	Manages pronunciation of end-consonants, 'th' consonants, vowels and diphthongs accurately.
	Student mumbles excessively.	Articulation is unclear and leads to distortion of meaning.	Articulation is generally clear and there are few instances of distortion of meaning.	Articulation is clear but intonation is ungainly.	Articulation is clear, intonation and inflection is natural.
Pacing, Rhythm and Fluency	Pace of reading is fast with no stress or rhythm.	Pace of reading is appropriate.	Pace of reading is appropriate.	Pace of reading is appropriate.	Pace of reading is appropriate.
	Words are read individually.	Word stresses are evident.	Word stresses and rhythm (clustering of words) are evident though not always consistent.	Word stresses and rhythm are evident and accurate for impact.	Word stresses and rhythm are evident and accurate for impact. Individual reading style is in sync with the group's overall reading effectiveness.

Assessment of Photography and Language Skills in the Production of a Photo Essay

Noelene Liew Oi-Yin
Kavitha Kanniah
Muthu-Ramasamy Amirtham Ammal
Lee Sau Foon
(English Language Department)

Abstract

The English Language Department embarked on Photojournalism as the English Language (EL) Applied Learning Programme (ALP) project for all Secondary 3 classes. The objective of the Photojournalism ALP is for the students to apply photography and language skills to create photojournalistic entries. The 10-week programme aims to enthuse the students in their EL learning via the learning of photo-taking and descriptive writing. The project integrates visual media with critical analysis and interpretation skills which students generally see as different entities. Through this programme, the students learn ways to marry language skills with visual representation. The desired end-product of each collaborative team is an electronic photo story based on the chosen theme. The theme of their project this year is 'Appreciation'.

Introduction

The theme 'Appreciation' is chosen to offer the students scope and flexibility in their ALP projects. Some students interpreted the theme as the appreciation of the various aspects of the school, such as, the staff, holistic programmes and facilities. Others looked beyond the school context and explored many other possible facets of appreciation, such as, the appreciation of nature and culture.

To kick start the project, we invited an external vendor, The Essential Lifeskills Group, to conduct an introductory workshop on Photojournalism for our students before we embarked on the project proper.

In the process of implementing the Photojournalism project, the teachers adhered closely to the SOLO taxonomy. We believe that using SOLO Taxonomy would help develop student thinking and learning in an increasing order of complexity. It encourages the students to think about where they are currently with their learning, and what they need to do in order to advance.

Literature Review

Photojournalism is a particular form of journalism that employs images in order to tell a news story. It is a powerful medium used to convey social issues to the audience. The article in Inforefuge ("The Emergence of Photojournalism and its Effect on Society", n.d.) states that photojournalism is "the best way to convey a message to the general public" and "in shaping the attitudes of individuals viewing these photographs."

Cindy Smith ("Thoughtful Learning", 2015), a middle school teacher whose class embarked on a Photojournalism project, there are several reasons why Photojournalism is powerful. Firstly, it is powerful because it is student-centred as the students drive the project forward. They actively seek out answers and materials, and are empowered to take control of their learning. Secondly, Photojournalism also creates authentic learning because students study real-life issues and link it to their daily lives and the community they live in. Thirdly, Photojournalism provides a platform for students to internalise their learning and to be able to transfer it to their photo essays. A sense of accomplishment is achieved when they are able to convey the message of their project successfully and are able to influence their audience's thinking through their photo essay.

Studies have been done on Photojournalism and they all spell out the benefits of combining photo images with interpretative language. This type of journalism is distinguished from other forms of journalism due to its qualities. The images must be timely, referring to the fact that they have meaning in context to recent event. They are also objective, meaning the situation implied by the image is a fair representation of the events in both content and time, and they are narrative, which is when the images combine with other news elements to make the facts relatable to the viewer and/or reader on a cultural level.

From the teaching and learning perspective, the rationale for incorporating the SOLO taxonomy (Biggs, 2013) into the Photojournalism ALP is multi-faceted. Firstly, it helps teachers to thoughtfully shape the learning intentions and experiences. The objectives and intended outcomes, and the progress required to see the project through are made very explicit from the start. Next, it makes it easy to describe the success criteria explicitly to the students, especially when the assessment rubric is designed in line with the progressive categories of the SOLO Taxonomy. Also, the teachers are able to provide students with feedback and can feed-forward in order to achieve the learning outcomes. Lastly, it helps the students to reflect meaningfully on what the next steps in their learning are as it is an easy-to-remember staged approach for them.

Methodology

The students attended a workshop conducted by an external vendor where they learnt journalistic as well as photography skills. The four levels of feedback were applied during this workshop to critique the students' mini projects to demonstrate the expectations of such a Photojournalism project and what the areas for improvement were for each project. Students came to be aware of the usefulness of the four levels of feedback in helping them move forward. It also helped them better understand what the expectations were of their project. Using what they have learnt at the workshop, students then apply the knowledge in their projects.

The target group is all Secondary 3 students. The project was conducted in Semester 1 over a 10-week period. It provided the students with ample time to discuss the focus of their project with their group members and decide on the locations they were going to take their photographs.

The students carried out the project in stages. Students were first briefed on what Photojournalism is all about and were shown samples of model pieces of work. The focus was on the photos and the message/caption under each photo. Students came up with ideas on why each photo had a specific notion or idea. We also discussed the mood, feelings and tone of the words used to describe the work.

Then they were given the opportunity to brainstorm on the given theme, Appreciation, in their respective groups, based on the 5W1H questioning technique. They then decided the area of focus they preferred, for example, the appreciation of a culture or a particular type of food or building.

Before the students embarked on their discussions and wrote their 150-word introduction, the teachers built in appropriate scaffold to help them at the planning stage. For instance in the introductory write-up, students are expected to indicate:

- What/who they choose to show appreciation of/to?
- Why they have made this decision?
- Why the group felt that it is important to show appreciation of the chosen subject matter?
- What background knowledge might they need to include to make the introduction to/presentation of their subject matter clearer?

- How does the project aim to achieve its goal of showing appreciation to the chosen subject matter?
- What aspects of the chosen subject matter will they be highlighting in this ALP?
- What do they hope readers will take away after viewing their projects?
- What do they aim to achieve through this project?

This questioning process helped the students clarify the intent of their projects and be more focused.

There was constant monitoring of the students' progress by the teachers. Besides correcting their grammar, the teachers applied the four levels of feedback to the students' work. They guided the students based on the application of their critical eye, language skills in writing the introduction and captions for the photo essay, and whether the visual representations are aligned with the theme. The assessment rubric based on the SOLO Taxonomy was particularly useful here. It helped the teachers ensure that the students master descriptive (caption) writing as well as photo-taking skills in increasing complexities.

The software, Adobe Spark Page was used to allow the students to create their photo stories digitally, which made storage of the students' work easy and convenient. The electronic end-products were also parked at the department Secondary 3 ALP Google site for sharing and future reference.

Results and Discussion

The ALP PLT developed a rubric for assessment based on the SOLO Taxonomy (Annex 1 – Rubric for Sec 3 Photojournalism Assessment). The rubric assessed the students for content (including the introduction, conclusion and captions) and photography techniques. To assess if the relational level has been reached, students should be able to cover a variety of aspects and link them in an organised and logical way. A well-thought caption should be well-structured and worded appropriately to capture the essence of the photograph. There should also be logical flow in the arrangement and sequencing of the photographs. The whole framework should be well-developed and linked to the introduction of the chosen topic.

A Google Site (URL: https://tinyurl.com/bpssalp) has been created and students' good work are placed there as exemplars for showcase to future groups. This is one form of encouraging the students to produce better quality work. All relevant resources (instructions, templates,

exemplars) for the Photojournalism project are also placed in the Google site as teaching resources. Anyone can use these for future references on Photojournalism.

Snapshots of the Photojournalism Google Site

A survey at the end of the project was also conducted to get feedback from the students and teachers on the merits and usefulness of the project. 45.1% of the 82 students surveyed said they agreed or strongly agreed that they enjoyed the Photojournalism workshop and 58.6% said the workshop made them more aware of what Photojournalism was all about. An overwhelming 90.2% said they would recommend the Photojournalism workshop to their juniors. The most useful skills they learnt from the workshop was photo-taking skills and caption writing. 63.4% enjoyed working with their classmates on the ALP project. Through this project, the students reflected that while working with group members could sometimes be challenging, they learnt useful communication skills and how to work better as a team. They also enjoyed being able to put their photography skills to the test and coming up with creative captions for their photos.

Conclusion

One concern that arose after the completion of the project was that the software for the student's submission of the project (Adobe Spark) was the only software that was used. Perhaps more similar software could be explored so as to allow the students to exercise choice. Also, a software that allows teachers to give feedback/side notes in the programme itself would be more useful.

The time frame for the project was too short. Normal Technical students made use of some curriculum time to work on the project, so this enabled them to have closer supervision and tighter control over the project. However, Express and Normal Academic students were not able to use curriculum time for the project, thus monitoring and giving feedback from the teachers was done outside of curriculum time – students and teachers found this a challenge

and faced time constraints. Teachers must ensure that the quality/depth of learning and quality of the students' work is not compromised.

A once-off, 3-hour introductory workshop on Photojournalism may not be sufficient time to give students a quality lesson on photography and journalism skills. For in-depth learning to take place, more time would be necessary. Alternatively, a follow-up session by the vendors could have been arranged so that a professional critique is given and we can assess students' learning better.

References

The Emergence of Photojournalism and its Effect on Society (n.d.). Retrieved from https://www.inforefuge.com/emergence-of-photojournalism

Thoughtful Learning. (2015, October). How Photojournalism Connects Kids and Community. Retrieved from https://k12.thoughtfullearning.com/blogpost/how-photojournalism-connects-kids-and-community

Annex 1: Rubric for Sec 3 Photojournalism Assessment

Criteria	Prestructural (0 marks)	Unistructural (1 - 3 marks)	Multistructural (4 - 7 marks)	Relational (8 - 11 marks)	Extended Abstract (12 - 15 marks)
Content (15m) (write-up / introduction / captions / conclusion) *(Based on the theme of 'Appreciation of the Environment')*	Theme is not addressed.	Only one aspect of the theme is addressed. *(Exemplar: Mere description of the clean environment – I appreciate the environment we live in because we have clean air, clean roads and clean beaches)*	More than one aspects / facets of the theme are addressed. *(Exemplar: Description, historical background on how the clean environment came about, the people involved and the impacts of a clean environment* *- Each is addressed separately as individual segments without any link)*	Students are able to link all aspects using appropriate connectors in a coherent and chronological manner, and draw a connection to a greater good. *(Exemplar: In order to appreciate the clean environment that we have today (description), we first need to appreciate how our forefathers overcame XYZ challenges to give us what we have today (historical). In addition, XXX agencies and even our cleaners have been instrumental in helping to provide us with the clean environment we enjoy (people involved). Singapore is able to use this Clean and Green concept in its tourism drive to attract millions of visitors each year (impact).)*	Not only are all aspects explained and linked coherently, students' reflection extends into a self-initiated community project proposal. *(Students transfer the appreciation and knowledge into action that benefits the wider community)*
Photography techniques (15m)	No evidence of photography techniques used.	Evidence of a single technique that is applied to all photos.	Evidence of 2 – 3 techniques[1], limited to one technique per photo that are applied to all photos.	Evidence of more than 3 techniques, limited to one technique per photo that are applied to all photos.	Evidence of a variety of techniques that are applied to all photos. More than one technique is sophisticatedly used in each photo to yield effective composition.

[1] Examples of photography techniques – rules of thirds, leading lines, framing, symmetry, uncluttered background and contrast

Enhancing the Learning of MTL Through the Use of Commercial Advertising

Nurul Syakinah Sahak
Djohan Abdul Rahman
(Mother Tongue Language Department)

Abstract

The Applied Learning Programme (ALP) – Broadcast Journalism through Commercial Advertising - has always been one of the key programmes of the Mother Tongue Languages (MTL) Department. Previously, the programme focussed mainly on equipping students with the necessary skills needed to deepen their language proficiency through broadcast journalism, leveraging on the affordance of Information and Communication Technology (ICT). In 2017, the MTL Department decided to deepen the learning of the MTL through the skills of Commercial Advertising, it also helps to heighten engagement level with the students. The project is further augmented the use of a set of performance rubrics crafted based on the principles of SOLO Taxonomy as well as the use of the 4 Levels of Feedback so as to enable the students to be better informed of the success criteria, using feedback to level up their performance.

Introduction

Prior to 2017, during the lessons that were designed by the MTL teachers, they realized that the students were often at the pre-structural level or at the uni-structural level – which is singular and isolated language items. This year, with the knowledge of SOLO taxonomy in the design of their daily lessons, the teachers seek to elevate the students' thinking and guide them towards reaching a high order performance by the application of the language in context.

Through discussions, it was observed that the feedback given by teachers to their students previously were mostly at the personal or task level. Feedback that was conveyed at the personal level did not really provide the feedback needed for the students to close their performance gaps. For example, feedbacks like 'Good try!' or 'Well done' do not specifically provide the clear information on how the student can progress. When feedback was given only at the task level, the feedback given will simply tell the students directly which part of their tasks is correct or incorrect, without providing the reasons or explanation behind it. The MTL department will strive to improve the way feedback was given by explicitly incorporating the 4 Levels of Feedback in the teaching and learning language. The teachers also believe that the

research that was conducted is necessary in assisting students' thinking process, thus encouraging them to self-regulate in their learning.

Literature Review

It is undeniable that assessment is integral to learning. Spiller (2009) found that feedback is an important part of the learning cycle, but both students and teachers frequently express disappointment and frustration in relation to the process in which this is done. Spiller added that:

> *Evidence suggests that when conversation around assessment and feedback is extended and students are more active participants in the whole process, then feedback is likely to be most useful to students' learning.*
>
> *(Spiller, 2009)*

Apart from Spiller, Black and William (1998) also focus on the importance of assessment in the classroom-specifically formative assessment. In their research, it was found that emphasis on formative assessment can lead to significant research gains. They further discovered that "although there is no guarantee that it will do so irrespective of the context and the particular approach adopted, we have not come across any report of negative effects following on an enhancement of formative practice" (p.17).

Methodology

It was based on the findings of the above literature that the MTL department has decided on adopting the pedagogical approach of explicitly using SOLO taxonomy and the 4 levels of feedback in teaching and learning in assisting students to internalise and process the demands of their tasks.

The project on using Commercial Advertisement was carried out over a period of 10 weeks of which 5 weeks were conducted during curriculum time to teach students the necessary skills required. The target group for the project was Secondary 2 MTL students and it was conducted in Term 2. In order to gather research data, qualitative surveys in the form of pre-intervention and post-intervention surveys were conducted. The survey consisted of 10 questions that seek to gather students' response on their knowledge of commercial advertisement and their subject teachers' feedback in the classroom. The data collected in the pre-survey was then

compared against the data collected post-survey to track the teachers' progress in effectively using SOLO taxonomy and the 4 Levels of Feedback to enhance the learning from Commercial Advertisement.

The project was carried out over a period of 10 weeks of which 5 weeks were conducted during curriculum time to teach students the necessary skills needed in commercial advertising. The target group for the project was Secondary 2 MTL students and it was conducted in Term 2. In order to gather research data, qualitative surveys in the form of pre-execution and post-execution surveys were conducted. The survey consisted of 10 questions that seek to gather students' response on their knowledge of commercial advertisement and their subject teachers' feedback in the classroom. The data collected in the pre-survey was then compared against the data collected post-survey to track the teachers' progress in effectively using SOLO taxonomy and the 4 Levels of Feedback to enhance the learning of ALP.

In executing the programme, the students were given themes on the commercials that they have to produce. It was intentional that the use of language was contextualised by the commercials that the students were tasked to film. In this way, the specific language components related to "Commercial Advertisements" will have to be taught and highlighted and used in a context.

During pre-production, students would draft scripts using their Mother Tongue languages, and at the same time plan the sequence in storyboarding needed produce an effective commercial. There is also an attempt for product differentiation so as to catering to the varied learning ability of the students.

The commercial ranged from product placements where students will only need to focus on "marketing" a single product (catered to assist Lower Ability students). On the other hand, some students will produce commercials touching on social issues which will expect an exploration of broader issues involving a higher degree of critical thinking and ability to use persuasive language (for Higher Ability students).

After the planning has been done, based on the scripts that they had written, the students then went into the post-production stage which involved the technical aspect of the programme – recording the video and editing the final product. Students were encouraged to insert audio and visual enhancement (music and/or caption inserts) that they have learned to make the commercial more appealing to the viewers. After the completion of the commercial, the students will submit the end-product to the respective teachers. The teachers will then assess the commercial based on two aspect:

1) The linguistic aspect of which the assessment will be graded based on the script that was submitted; and
2) The technical aspect of producing the commercial.

In the process of executing the product, the MTL teachers are keenly applying the 4 Levels of feedback (Hattie and Timperly), in particular, the teachers found themselves clearer with what feedback they need to give by looking at the stage of production the students were at as well as by gauging the readiness of the students in progressing to the next level of thinking. Specifically, for the Sec 2 Normal Technical students, the types of feedback given were more tasks specific and guided as this group of students required more specific instructions to guide them to complete the task with the exception of 1-2 students. For the Sec 2 Express students, generally the feedback that teachers gave were at process level such as "I think you are right on track, however, how do you think you could further improve the sequencing of the scripts?" or "How do you thinking such comments will affect the audience watching your commercial?" Such feedback required students to thinking deeper about what they were doing, especially the latter feedback, it required a higher degree of self-regulation which we would help us nurture our students to come more self-directed.

In a nutshell, the process by which the MTL department used to increase the language proficiency of the students was based on contextualising meaningfully for the students the use of language – "Commercial Advertising" while leveraging on the affordance of technology. The students were engaged and language learning has become more meaningful for them. The process is augmented with performance rubrics to clarify expectations and thinking required, championing the students to become more self-directed learners through used of meaning feedback to close learning gaps observed.

Results and Discussion

The rubric for the ALP was closely aligned to SOLO Taxonomy. Based on the outcome, teachers will be able to identify their actual level of understanding pertaining to the lesson.

Criteria	Beginning (Unistructural) (1 - 3 marks)	Emerging (Multistructural) (4 - 7 marks)	Excellent (Relational) (8 - 11 marks)	Mastery (Extended Abstract) (12 - 15 marks)
Ideas development	**Identify** ideas with minimal attempt to address the question.	Addresses the question and **IN ADDITION** **Illustrate** ideas with some connections made to link the ideas together.	**IN ADDITION** **Relate** and **integrate** ideas and **substantiate** with appropriate examples to show development of ideas.	**IN ADDITION** **Critically reflect** ideas with **sound reasoning** and make **judgement** exhibiting creative and/or critical thinking.
Examples	- One-liner generic statements	- Able to illustrate a few relevant content	- Use of discourse markers (furthermore, despite, hence)	- *What if* - Analytical opinions
Guiding questions (feedback given) used to deepen thinking	The music used in your advertisement is not appropriate. Please find another alternative.	The storyboard that you crafted is interesting. What do you think that can be done so that the flow between the scenes can be filmed and linked clearly?	The end product is good as it follows the theme of the project. How can you enhance it to make it more eye-catching?	The commercial is clear and well-crafted. What other elements can be put in place to make the commercial even more captivating?

Rubrics for Language Acquisition (Content) based on SOLO Taxonomy
(Structure of Observed Learning Outcome)

Through pre-intervention and post-intervention comparison, it was evident that there is an improvement in the students' understanding and quality of work submitted, as seen by the marks collated by the individual Language Units.

Specifically, from the pre-intervention and post-intervention survey results comparison, it was discovered during the pre-intervention survey, 60% of the students found the feedback given by the teachers to be useful and they benefitted from the guidance provided. However, upon

the completion of the programme, the findings showed that the number of students that found the feedback given by their teachers being helpful increased to 75%. Interestingly, while previous research does not discuss feedback given at the personal level in great detail, the survey results showed that feedback given at the personal level was able to boost students' morale especially when they find the assigned task challenging. As such, it is a reminder to us teachers to not only concentrate on giving feedback to assist students' thinking process but to also be mindful of students' social and emotional learning (SEL[1]) in the classroom.

Conclusion

To conclude, the research was a resounding success as it truly benefitted both students and teachers. The teachers found themselves professionally challenged while trying to practise SOLO taxonomy and giving feedback more meaningfully to the students. The types of feedback[2] given will assist the students to become more self-directed learners. In addition to that, by designing the rubrics using the SOLO taxonomy, the teacher would be in a better position to inform the students the performance standards required as well as the thinking expected for the project. In this way the learning objective would be met better.

With regards to the joy of learning, the students definitely benefitted from the whole experience as their engagement was much evident. The students were empowered to create authentic end-products (commercials) and based on the result, deeper learning has taken place.

References

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: principles, policy & practice, 5*(1), 7-74.

Ministry of Education. (2017, June 25). Social and Emotional Learning. Retrieved from https://www.moe.gov.sg/education/programmes/social-and-emotional-learning

Spiller, D. (2009). Assessment: Feedback to promote student learning. Retrieved from http://www.waikato.ac.nz/tdu/pdf/6_AssessmentFeedback.pdf

[1] SEL: According to MOE, SEL refers to the acquisition of skills to recognise and manage emotions, develop care and concern for others, make responsible decisions, establish positive relationships, and handle challenging situations effectively

[2] Based on the 4 Levels of Feedback (focused on the process and self-regulation level of feedback)

Developing Students' Thinking Process Skills in Solving Real-World Problems

Kumari Shanker
Chua Weilin
Nai Chheu Yee
Khet-Hoo Yiin Hwa
(Mathematics Department)

Abstract

Over the last decades, the concept of assessment has evolved. In particular, alternative assessment concepts and strategies have been increasingly adopted by practitioners in classroom practices. Traditional assessments are usually teacher-structured, provide students limited venues to demonstrate what they have learnt and there is little interaction amongst students. On the other hand, alternative assessments are more student-orientated. Performance tasks are usually based on authentic contexts which are likely to occur in a real-world setting whereby students get to demonstrate the depth and scope of learning as well as develop curiosity, flexibility, creativity and perseverance. Students usually work in groups thereby promoting teamwork, collaborative and interpersonal skills.

Introduction

The Mathematics teachers co-designed an innovative lesson package for the Secondary Three Express and Normal Technical students on the topic of Quadratic Functions and Graphs. The intended outcome of the lesson package was to foster the joy of learning for Mathematics through the use of ICT-enabled learning experiences with real-world situations.

Using the Structure of Observed Learning Outcomes (SOLO) Taxonomy, the teachers looked at what they do purposefully – through the lens of prestructural, unistructural, multistructural, relational and extended abstract learning outcomes. To help scaffold students' learning in terms of levels of complexity, teachers customised the design of lessons, activities and worksheets for the different student profiles. Teachers also integrated ICT in the lessons through appropriate use of ICT apps to enhance students' learning. The lesson package culminated in a performance task whereby students worked in groups to discuss and solve real-world problems. Teachers used the Polya's model to train students to use varied forms of self-directed metacognitive questioning in Mathematics problem-solving.

Teacher makes reference to the SOLO Taxonomy while explaining the lesson package.

To assess students' performance, teachers developed a rubric based on the SOLO Taxonomy which aimed to provide a more holistic picture of a student's abilities and highlight areas where further improvement is needed. As part of Assessment for Learning, teachers provided timely and targeted feedback (verbal or written) to students using the Four Levels of Feedback to help students close their learning gaps.

Literature Review

Charles and Lester (1984) made several research-based practical suggestions in planning a problem-solving lesson. One of them is to plan for specific teaching actions before, during and after the solving of a given problem. The 'before' stage refers to the time when the students discuss the given problem to understand it and to think about the strategies that can be used. The 'during' phase refers to the time when the students are working on the solution individually or in groups. The 'after' phase refers to the time when the students discuss their attempts at solving the given problem.

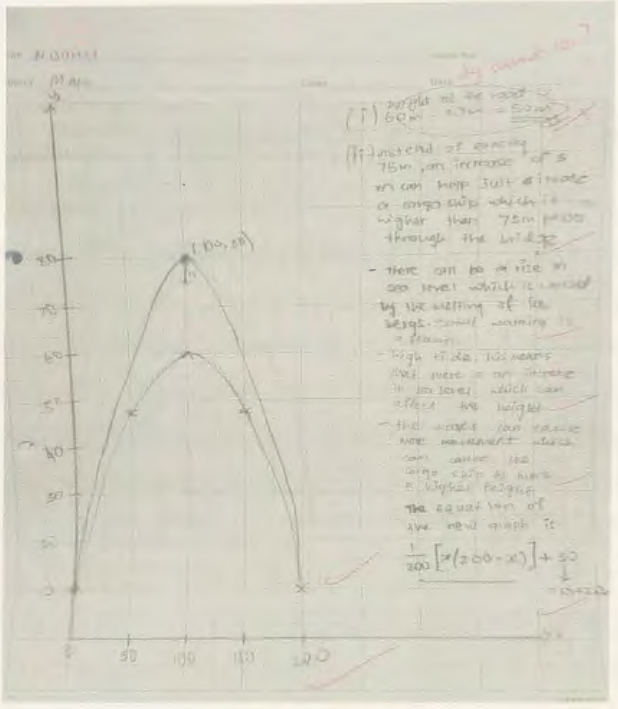
At every stage in a problem-solving lesson, students may experience some difficulties. Newman (1983) suggested a useful scheme to help teachers identify students' difficulties during problem solving. According to this scheme, the difficulties could be in reading, comprehending, knowing strategies, transforming, carrying out procedures and making sense of the computation.

Methodology

The teachers embarked on this project at the start of the year. Based on the identified topic, they developed a lesson package which was designed in terms of levels of complexity and spanned across four to five lessons. The target groups were the Secondary Three Express and Normal Technical students. The lesson package was differentiated to cater to the learning needs of the different groups of students.

The Secondary Three Express students started learning about basic concepts of the topic with an ICT-enabled self-exploratory activity. The worksheet was designed in a way to guide students to make observations and find the relationship between the equations and graphs of quadratic curves. Students were then taught more concepts related to the topic and given questions at the unistructural and multistructural levels for further practise. After which, they were given a pre-performance task at the relational level which involved linking and applying

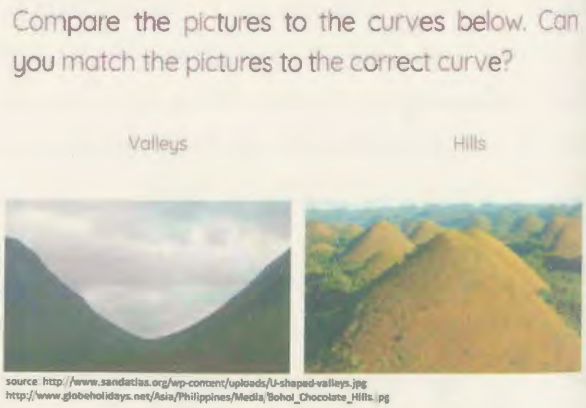
various concepts learnt. Specifically, they were to find out the maximum profit using the given quadratic equation.



Sample of student's work

The lesson package culminated in a performance task based on a real-world setting. Teachers explained the assessment rubrics to the students prior to the task so that students have clarity about the success criteria based on the SOLO Taxonomy. This question was open-ended and allowed students to extend their knowledge and skills in a real-world context and critically reflect on suitability of assumptions and feasibility of solutions. Students also developed their own self-check lists based on Polya's model to guide them in the metacognitive processes.

For the Secondary Three Normal Technical students, they began the lesson by doing an online activity to identify the various quadratic curves in the form of "hills" and "valleys" at the google site. This online activity was pitched at the unistructural level whereby students linked the shapes of quadratic curves to various real-life examples such as mountains, valleys and bridges. Next, they moved on to learn about the mathematical terms and concepts using a customised worksheet which comprised of questions to build students' understanding and competency at the multistructural and relational levels.



Online Mathematics activity

Towards the end, students completed a performance task based on a real-life setting. Teachers went through the rubric with the students prior to the task to achieve common understanding of the assessment criteria and levels of performance.

	Unistructural	Multistructural	Relational	Extended Abstract
Mathematical Content	• Apply one related concept correctly • Sketch the shape of the graph correctly	• Apply more than one related concepts correctly • Sketch the graph correctly and indicate the coordinates of the maximum point correctly	• Apply and link various related concepts correctly • Sketch the graph correctly and indicate essential parts of the graph correctly • Explain with clear workings how the graph is related to the solutions in the given context	• Make sensible assumptions and extend ideas to propose plans for the construction of a new bridge in a new context • Explain with clear workings how the graph is related to the solutions in the new context

Teachers adopted a more targeted approach to optimise student learning by giving appropriate levels of feedback. Besides giving personal and task feedback on what was good and not good as well as what was right and wrong, teachers also provided process feedback such as "Please support your workings using relevant data given" and "Please support your proposed solution(s) with suitable assumption(s)".

Students discuss and work collaboratively on the performance task.

Results and Discussion

A survey consisting of ten questions was administered with a total of 75 Secondary Three Express and Normal Technical students to find out their views on performance tasks. Questions 1 to 5 were aimed to find out how useful and effective Polya's model was for problem solving.

93.4% of the students responded positively that they were able to apply mathematical concepts to complete the performance tasks. Slightly above 70% of the students indicated that the Polya's model had helped them in becoming systematic in problem solving and better problem solvers.

Questions 6 and 7 were designed to assess whether the teachers' levels of feedback had helped students improve their performance whereas questions 8 to 10 were set to find out students' view on solving real world problems.

79.4% of students agreed that the levels of feedback given by teachers motivated them in completing the performance tasks. 93.6% of them indicated that the teachers' feedback had helped them to correct their mistakes and do better in their tasks.

32% of students did not enjoy solving real-world problems. This could be due to challenges surfaced by them such as the inability to understand the contextualised question fully and make the necessary assumptions due to their lack of exposure and experience. They lacked confidence in solving real-world problems as it entailed linking and extending concepts and ideas to a new context and there was no clear cut approach to solving the problem.

Nonetheless, the majority of the students enjoyed working on the performance tasks as they were able to see and appreciate the connection of Mathematics to real life better. They found the open-ended nature of performance tasks stimulating and challenging thereby fostering greater critical and inventive thinking. In the process, they also got to communicate their Mathematical reasoning and thinking and collaborate with their group mates to come up with the solutions.

Reflection

The teachers believe that performance tasks based on real-world contexts are valuable in developing students' appreciation of Mathematics with real-life applications, higher-order thinking skills, creativity and problem solving abilities. Designing performance tasks is challenging as there are multiple factors to consider such as authenticity, relevance, accessibility to students and duration. Faced with this challenge, the teachers worked together to draft, revise and finalise the performance tasks. Through this, teachers improved the quality of the tasks and enhanced their professional development through collaboration.

Conclusion

With the use of the SOLO Taxonomy, teachers were able to sequence teaching and learning in terms of levels of complexity more effectively so as to scaffold and facilitate students' learning. This deliberate planning and design of teaching and learning experiences was crucial in equipping the students with the necessary knowledge and skills required to solve problems

set at a higher level of complexity which, in this case, were the performance tasks. The teachers also had their first attempt at developing a rubric based on the SOLO Taxonomy. It was a meaningful learning experience for them as they gained greater clarity in how to define the criteria and use appropriate verbs to craft the descriptors in defining students' competencies according to the various levels of complexity. With regards to feedback, teachers were more conscious about the various levels of feedback and also more conscientious in providing process feedback on top of personal and task feedback so as to bring about different degrees of self-directedness in learning for the students. This project has room for continuous improvement. Teachers will continue to explore different teaching and assessment strategies to help students develop thinking process skills in solving real-world problems.

References

Charles, R. I., & Lester Jr, F. K. (1984). An evaluation of a process-oriented instructional program in mathematical problem solving in grades 5 and 7. *Journal for Research in Mathematics Education*, 15-34.

Newman, A. (1983). *The Newman language of mathematics kit.* Harcourt Brace Jovanovich.

Developing Scientific Thinking Skills Through Argumentation Approach Based on SOLO Taxonomy and 4 Levels of Feedback

Lim Si Ting
Annie Tan Yew Geok
Hsu Lay Keok
Mario Chua Chong Yi
(Science Department)

Abstract

This project focuses on the development of students' ability to analyse and think critically on scientific phenomena and trends through the argumentation discourse supported by SOLO Taxonomy and the Four Levels of Feedback. The argumentation-driven approach requires students to critique their peers' responses by analysing critically the evidences and scientific concepts presented to justify their claims. The Four Levels of Feedback guided students in giving constructive feedback to deepen their thinking. To support the scientific thinking process with clarity on success criteria, rubrics for the three science disciplines were crafted using SOLO taxonomy on how a sound and coherent scientific explanation based on scientific concepts can be constructed. It was found that 50% of the students had improved performance scores and produced more coherent explanations.

Introduction

In a traditional classroom, the dialogue between teacher to student and student to student often fall short of sustained exchange of claims and reasons that constitutes an authentic intellectual discourse. The learning focus of the project was to investigate whether argumentation-driven science lessons, incorporating the SOLO Taxonomy and 4 levels of Feedback, will improve the student's critical thinking skills to analyse scientific data source and trends provided in questions and develop scientifically sound and coherent explanation. It was observed that students had difficulties providing sound explanation due to the inability to relate scientific concepts to the context of the questions posed. The current practice to overcome this weakness in students is to expose them to answer different types of questions which demand application of varied scientific concepts while the teacher elaborates on how to derive the explanations. However, it has not been effective as students still lack the ability to support their explanation with relevant scientific data and concepts. The intended outcome of this project was for teachers to design an argumentation-driven science lessons which aimed to develop students' critical and inventive thinking to solve scientific questions or problems based on the data source and trends provided. In view of the differing nature of the three science disciplines, namely Biology, Chemistry and Physics, the team was split into 3 sub-

groups to plan and design the respective science lessons. The project was conducted in Term 1 and Term 2 spanning across 3 lessons for the three sciences.

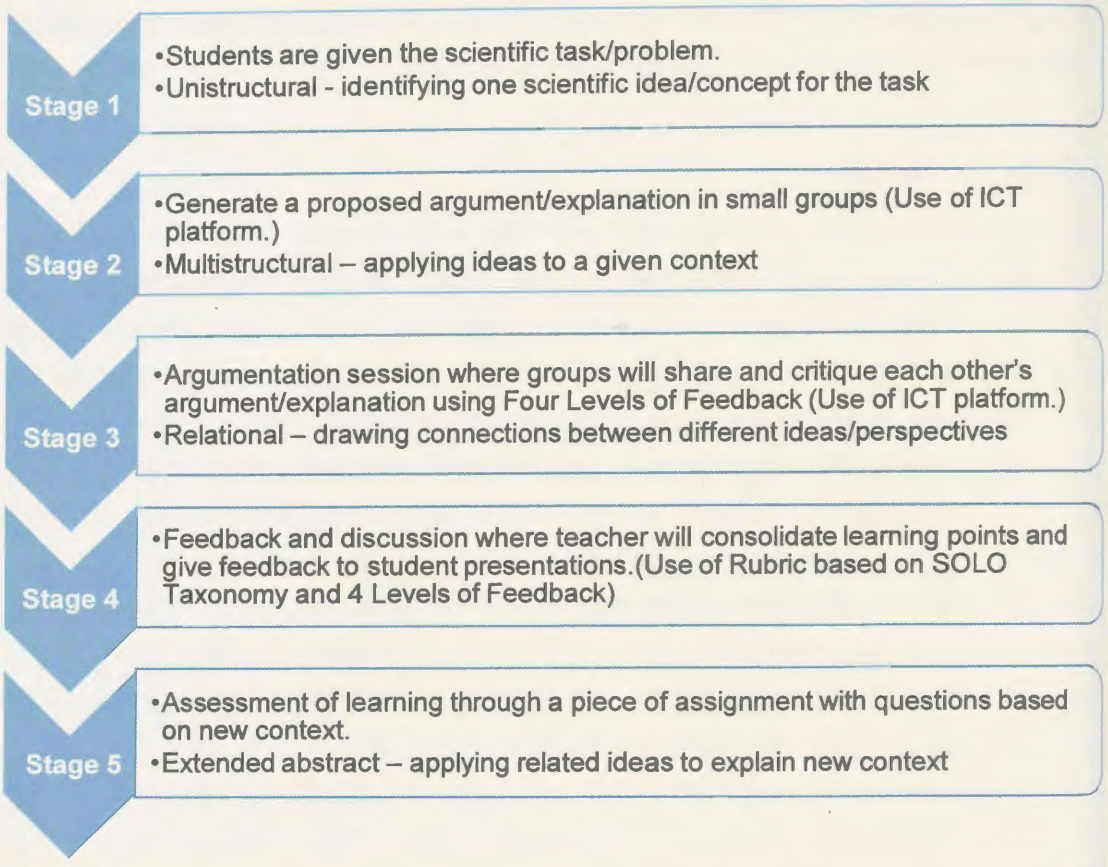
Literature Review

Research studies had shown that argumentation plays a role in the generation and justification of knowledge claims (Kuhn, Hemberger & Khait, 2014). Cognitive scientists claimed that arguing is not just central to human thinking and reasoning but to prepare them for higher order thinking skills. Lev Vygotsky's social development theories had emphasized on the fundamental role of social interactions being essential to support cognitive development in children. The distinct difference between an argument and argumentation is that an argument is a static product formulated by a single individual, and thereafter is available for consideration by others. On the contrary, argumentation is a social process engaged by at least two people to seek a common understanding. The argumentation approach aims to develop skills such as generating reasons and evaluating evidence. Current researches have also indicated that student engagement in scientific argumentation could foster a better understanding of the concepts and the processes of science (Sampson et al., 2013) thus enabling students "to solve problems and advance knowledge" (Duschl & Osborne, 2002). In short, argumentation empowers students to co-construct knowledge and develop their ability to think critically in putting forth a sound explanation for their claims.

Methodology

The science teachers adopted the argumentation framework in order for a higher frequency of intellectual discourse between students in the classroom as it demands students to critically examine the coherence of explanations supported by scientific evidences from their peers. To further support the argumentation approach, students were also instructed to provide meaningful and constructive feedback to their peers by applying the Four Levels of Feedback.

The argumentation-driven lesson package for the three science disciplines were designed based on the 5-Stage Instructional Model (Figure 1) to guide the lesson structure. This 5-stage instructional model is structured with SOLO Taxonomy to intentionally enable cognitive development to progress with increasing complexity as the lesson progressed through the stages (Biggs & Collis, 1982). In order to scaffold learning for students, questions were provided to guide the development of students' critical thinking at each stage. The lesson package was implemented to a Secondary 3 Express class for the physics and biology units, and a Secondary 4 Express class for the chemistry unit.



Adapted from Sampson, V., & J. Grooms. 2009

Figure 1: 5-Stage Instructional Model

The argumentation took place at stage 3 of the Instructional Model where students were provided with the following guiding questions in line with the 4 levels of feedback to facilitate the argumentation session and trigger deeper thinking:

- Where is your evidence to support your claim? *[Task level]*
- How does your evidence support your claim? *[Process level]*
- Why is your evidence important? *[Process level]*
- How does your justification of your evidence fit with accepted scientific ideas? *[Self-regulation level]*

During the argumentation process, students used process level of feedback to help one another think deeper and achieve self-regulation level where students reflected on how to improve their own answers. This has enabled students to revisit their initial explanation and make improvement, thus making learning an iterative process which deepens their learning.

Rubrics for all three sciences crafted, using SOLO taxonomy as a guiding principle, provided students the clarity of the success criteria in constructing a scientifically sound

explanation/argument. Both teachers and students leveraged on the rubric to bring about constructive dialogue and feedback in the argumentation discourse. This is because the rubrics helped teachers and students to understand the different levels of learning outcome needed to be attained in solving the scientific task or problem posed. Due to the difference in nature of the three science, each science modified the rubrics according to the task given.

	Unistructural	Multistructural	Relational	Extended Abstract
Analyse evidence to support argument	• Identify a part of the evidence/ data	• Identify a few pieces of the evidence/data	• Identify and analyse a few pieces of evidence/data to **support the argument explicitly**	- Evaluate the contribution of the parts to the evidence/data to support the argument. (interpretation of analysis provided)
Describe argument coherently	- Description of the argument has one relevant scientific concept	- Description of the argument has several relevant scientific concepts	- Description of the argument has several relevant scientific concepts, and my description **links** these concepts	- Description of the argument has several relevant scientific concepts, links these concepts and my description applies these concepts in a **new way/ other contexts**

Figure 2: Generic Rubrics

The biology unit adapted a question from Scientific Argumentation in Biology: 30 Classroom Activities that focuses on the movement of molecules in and out of cells. Students were given a microscopic view of blood and were required to generate a claim to explain the observation.

Students generating tentative claim

The chemistry unit selected ten-year series data-based questions from the topics, speed of reaction and electrolysis. These topics are selected because of the difficulty level and complexity of these topics, thus students tend to face more difficulty when handling application questions from these topics.

The physics unit crafted a question based on the Bernoulli's Principle and students were required to use pressure and velocity data of the aircraft and wing to design a poster to explain whether an aircraft can fly in outer space.

Students presenting their argument

Results and Discussion

Based on the pre- and post- test results, 50% of the students showed an improvement in their answers, particularly in their ability to provide sound scientific explanation at a relational level of thinking by making connection between the data sources and the relevant scientific concepts. In the post-test, students were able to demonstrate answering skills such as quoting from data, explaining evidence and using appropriate scientific concepts to the given context. It was also observed that students were making conscious efforts to connect scientific evidences to concepts in relation to the given context.

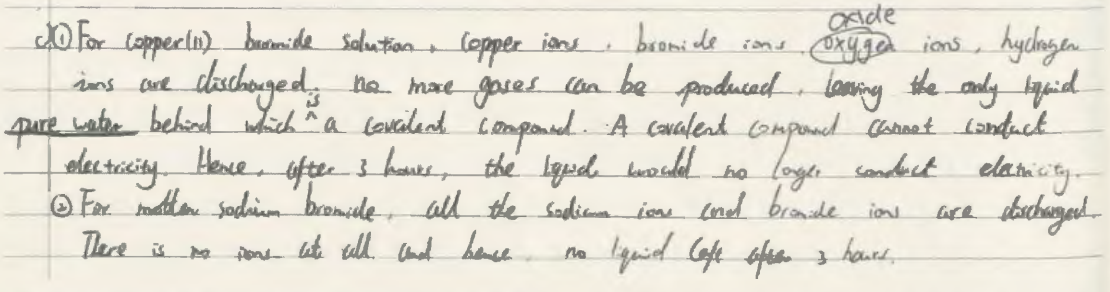
An example from the chemistry lesson before argumentation approach was introduced:

(c)The bubbling had ceased as the reaction was complete **(not required. need to explain where the bubbles come from and why it stops)** The liquid would no longer conduct electricity as there are no free moving ions present to conduct electricity as the reaction was complete due to excess heating **(Why? this is stating, not explanation)** No deposit,reddish brown fumes and no liquid was formed or left because the reaction is complete and there is excess heating.

Example of **Process Level feedback** given to individual students via online platform to help students improve on their answers.

Sample answers from pre-test posted on Padlet (Online platform)

From the pre - test answers, most students were only able to achieve the Multistructural level in SOLO Taxonomy where they showed the ability to list and describe their ideas, but lacked detailed explanation to link their ideas together using concepts learned in class.



Sample answer from post-test – explanation of discharge of ions and formation of water that does not conduct electricity shown

After the argumentation lesson, students moved from Multistructural level to the Relational level where they are able to better explain their observations from the given data using concepts learned in class. For instance, students were able to relate the ceasing of the bubbling observed to relevant scientific concepts.

In students' reflections about the argumentation-driven lessons, it was observed that they found the learning experience "*allows them to share their knowledge among one another*" and "*help them answer questions assigned with a better answer*".

Conclusion

The argumentation-driven lessons are effective in helping students to develop their ability to interpret and evaluate data-based questions. After the lessons, students showed the ability to write answers that can attain a more complex level of scientific thinking in the rubrics developed from SOLO taxonomy. The rubrics had also helped the teachers understand the learning gaps of students and this information became useful for teachers to improve on the lesson design and lesson package. Using the Four Levels of Feedback during the lessons also guided the teachers and students in giving more effective feedback that could help the students in their learning.

References

Duschl, R. A., & Osborne, J. (2002). Supporting and promoting argumentation discourse in science education. *Studies in Science Education, 38*(1), 39-72.

Sampson, V., & Grooms, J. (2009). Promoting and supporting scientific argumentation in the classroom: *The evaluate alternatives instructional model. Science Scope, 33*(1), 66-73.

Enhancing Understanding of a Social Studies (SS) Issue Through Use of Debate

Noorfatin Beevi Abdul Aziz
Linda Wee-Soh Suay Hung
(Humanities Department)

Abstract

This project focuses on deepening students' content knowledge on the SS issue of Transnational Terrorism as Security Impacts of Globalisation. Teachers often adopt a didactic lecture on the issue of the factors causing transnational terrorism without addressing students' prior knowledge on the issue. Students tend to have misconceptions or stereotyped ideas of matters concerning transnational terrorism, in particular the factors causing transnational terrorism. In this project, we create a lesson package to enhance student understanding of the concept and causes of transnational terrorism. Cooperative learning was adopted as an instructional strategy with students working collaboratively in their research work and in a class debate. Finally, with a Structured Response Question (SRQ) exercise, students gained a deep understanding of the various factors and their relationships causing the growth of transnational terrorism.

Introduction

Our team scanned the current and revised SS Syllabuses and learnt that the topic of Transnational Terrorism was one of the global issues students have to investigate. Recent national examinations (2014 and 2016 GCE O Level) had focused on this topic in the Source-Based Case Study (SBCS). Moreover, the many recent terror attack outbreaks in different parts of the world and their implications on global security as well as the launch of SG Secure in Singapore provided the team the rationale to examine this issue so as to enhance student assessment performance at the national examinations. Lastly, the class survey responses (Figure 1) revealed that a considerable number of students (in percentage) had misconceptions on the factors causing transnational terrorism namely Injustice (70%), Discrimination (52%), Poverty (35%), Internet (52%), and Religion (22%). These responses suggest that there is a critical need to address the students' misconceptions on these factors as a follow up action in the classroom.

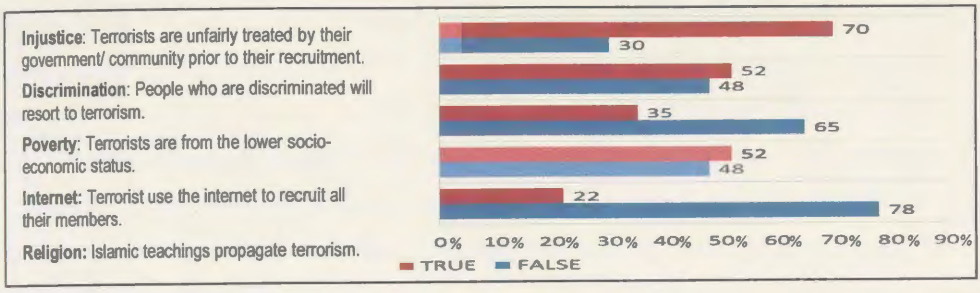


Figure 1

Literature Review

Cooperative learning refers to the instructional use of small groups so that students work together to maximize their own and each other's learning (Johnson & Johnson, 1993). Cooperative learning involves conscious thought which helps students make the experience as successful as possible. This is due to the many benefits that cooperative learning brings about when teachers incorporate it into their lessons. Researchers reasoned that cooperative learning places the responsibility for learning on the students, increases achievement and improves students' attitude towards school, learning and classmates and hence makes teaching and learning more fun (Smith 1987). These benefits justify its adoption as an instructional strategy for this project.

The use of a debate in this project provides experiences that are conducive to life-changing, cognitive and presentational skills of students. Through debates, students learn the ability to think rigorously and critically. This is because debate participation promotes problem solving and innovative thinking that helps students to build links between words and ideas that make concepts such as terrorism and causes of transnational terrorism more meaningful. Students also acquire the ability to synthesize wide bodies of information from the research they have done, and to exercise creativity in application of knowledge. Hence, debates encourage self-directed learners, allowing them to take control of their learning. At the very least, debates enable them to elucidate their standpoint through utilizing rhetorical eloquence. It instils in debaters a great sense of poise and confidence.

According to Biggs (1995), "SOLO Taxonomy, which stands for Structure of the Observed Learning Outcome, provides a systematic way of describing how a learner's performance grows in complexity when mastering many tasks, particularly the sort of tasks undertaken in school. A general sequence in the growth of the structural complexity of many concepts and skills is postulated, and that sequence may be used to guide the formulation of specific targets or the assessment of specific outcomes" (p.6).

As such, the team uses SOLO to design, plan and make decisions on the next steps of learning as evident from the three tasks in this project. The three tasks are the research work to understand facts and ideas of a specific factor of terrorism (Uni-structural), the class debate to draw relationships among the various factors (Multi-structural & relational) and the SRQ exercise to reflect and make suggestions (Extended-Abstract). In short, SOLO Taxonomy is integral to teaching and learning as it serves as a practical framework to match learning processes to learning outcomes. Moreover, as students move up the five levels, SOLO allows for deepening of student understanding of the concept and causes of transnational terrorism.

Methodology

Our lesson package was carried out with one Secondary Four Express class in Semester Two.

In Lesson One, Teacher sparked students' curiosity with "Guess the terrorist Game" to bring out students' misconceptions/ stereotypes/ perceptions of terrorists. Next, using Jigsaw Strategy as a collaborative learning strategy, the students formed base groups before they worked in expert groups to research and dialogue on a specific factor causing the rise of transnational terrorism. Then they returned to their base groups to share their learning in their expert groups. The lesson ended with a base group presentation and the teacher's consolidation of the four factors causing the rise of transnational terrorism.

For Lesson Two, the class applied their understanding of the four factors to a debate on the inquiry question "The availability of the internet is the most important cause for the growth of terrorism. Do you agree?" A debate rubric (Figure 2) developed based on the SOLO Taxonomy principles was shared with the students to achieve a common understanding of the assessment criteria for the levels of performance. Then in their expert groups, they argued to support their factor being the most important in relation to the other factors. At the end of the debate, the teachers provided a consolidated feedback of their understanding and application together with an assessment of the winning team and best speaker.

During Lesson Three, students applied their concepts to a new context that is, answering a structured-response question (SRQ) where they had to recommend strategies to tackle the growth of terrorism in the context of self-radicalisation. Teacher then assessed their answers with a LORMs rubric and ascertain that their misconceptions had been rectified.

RUBRIC Criteria	LEVELS OF PERFORMANCE			
	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
	Uni-structural	Multi-structural	Relational	Extended Abstract
1. Content: Use of Examples and Facts *Examples and facts are given to support to reasons.*	Content is based on given factor. Arguments show limited evidence and examples. Contain much inaccurate and or irrelevant information.	Content is based on more than 1 factor. Arguments are supported with some evidence and examples. Some information was inaccurate and/or irrelevant.	Content is based on linkages of given and other factors. Arguments are adequately supported with accurate and relevant evidence and examples.	Content is reflected based on linkages of given and other factors. Arguments are well supported with accurate and relevant evidence and examples.
2. Organisation and Clarity: Clarity of Content	Viewpoints are unclear and unorganized in presentation	Some viewpoints are clear. Limited organization in presentation	Most viewpoints are clear and organized in presentation.	Viewpoints are completely clear and well-organised in presentation.
3. Argument: Use of Argument *Reasons are given to support viewpoints and responses are outlined. Both clearly and orderly.*	Few or no relevant and convincing reasons.	Some reasons are relevant and convincing.	Many, but not all reasons are relevant and convincing.	All reasons are relevant, strong and convincing.
4. Rebuttals: Use of rebuttals *Arguments made by the other teams are responded to and dealt with effectively.*	No rebuttals or rebuttals are inaccurate, vague and illogical.	Weak rebuttals with vague evidence and somewhat logical arguments.	Effective rebuttals with accurate and logical evidence and arguments	Strong rebuttals with accurate and logical evidence and arguments.

Figure 2

Results and Discussion

The Jigsaw strategy allowed for active engagement as the students worked together to research, discuss and share their findings (Figure 3). It also encouraged collaboration as the students needed to work together as in teams. This strategy was an efficient way for the students to gain deeper insights into the four reasons for the spread of transnational terrorism, namely – ideology, internet, socio-economic discrimination, and political grievances.

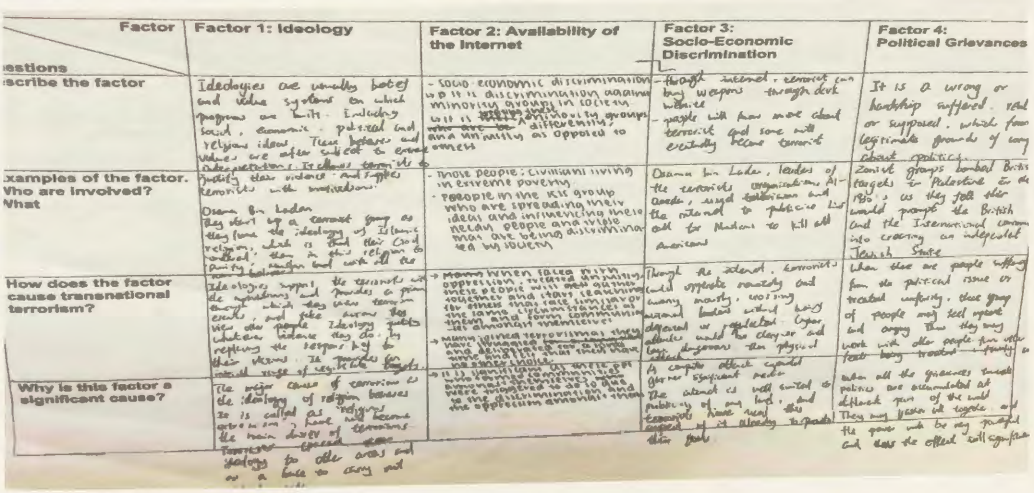


Figure 3

The debate was the most engaging. There were fierce debates as each team made arguments and counterarguments to support their grounds. Even a few quiet students participated to present their stand and support their team. It was an encouraging sight to see the class being lively as they applied their critical thinking and oral communication skills. For example, the wining team countered argued that although ideology influenced the growth of transnational terrorism, it was the internet that led to the rapid growth of transnational terrorism. (Figure 4) Moreover, feedback facilitated by the teachers reinforced their learning and cleared their misconceptions and biasness.

Group 1: Internet	
1. Content	***Arguments were adequately supported with accurate and relevant evidence and examples:*** ***Group did not provide specific facts but were able to provide substantial content information to support their arguments.***
2. Clarity	***Viewpoints are completely clear and well-organised in presentation.*** ***The argument of the group was consistent and clear right from the start.***
3. Argument	***All the arguments given are relevant, strong and convincing.*** - Internet allows the recruitment of its members in a convenient way - Internet allows the recruitment of its members with just one click. - Able to propagate their main aim- instil terror and fear among the people. - Osama Bin Laden publicize terrorism and thus able to kill more people than before. - Argue that Internet led to the rapid growth and follows the notion of the question
4. Rebuttals	***Strong rebuttals with accurate and logical evidence and arguments.*** - Before internet, terrorist was not as powerful.
5. Teamwork	***Strong engagement with team and team displays strong teamwork and follows the argument throughout, shows there was collaboration among all.*** - Yugesh and Vinitha were in synergy in terms of their arguments for their team. This shows that there was team work where the speakers were able to collaboratively rebut.

Figure 4

From their SRQ exercise, the students readily identified strategies to counter radicalization in relations to the factors of Internet and Ideology instead of Discrimination and Injustice. This showed that the students were able to recognise the limited importance of Discrimination and Injustice in causing radicalization in Singapore. Thus, their answers reflected a better understanding of the causes of transnational terrorism.

Conclusion

While the project had succeeded in engaging and helping students to analyse the four factors causing transnational terrorism, the students could still further deepen their understanding of the factors. This is seen in the debate where the students were unable to provide adequate examples and evidence as well as more convincing explanations to substantiate their stand. For improvement, it would be more desirable to plan more lessons for students to do research

and have deeper discussions on this topic. In addition, students reflected that the cooperative learning was a much more active and engaging instructional strategy and learning platform for them. Thus future lessons such as Issue 2 on managing diversity with the influx of foreigners and its impact on Singapore could consider such a strategy for students to discuss controversial issues in Social Studies.

References

Johnson, D. W., & Johnson, R. T. (1993). Cooperative learning and feedback in technology-based instruction. *Interactive instruction and feedback*, 133-157.

Bromley, M. (2015). Pedagogy: The SOLO taxonomy and constructive alignment. Retrieved from http://www.sec-ed.co.uk/best-practice/pedagogy-the-solo-taxonomy-and-constructive-alignment/.

Smith, R. A. (1987). A Teacher's Views on Cooperative Learning. *Phi Delta Kappan, 68*(9), 663-66.

Enabling Self-Assessment Using Writing Frames Augmented With Performance Rubrics Anchored on SOLO Taxonomy

Stephanie Lee-Chew Li Ling
Alice Yeo Ai Lee
Geraldine Chong Li Hoon
Cheng Ai Hoon
Jan Mak Wenling
(Humanities Department)

Abstract

To help students better meet the geography assessment standards, rubrics guided by the principles of SOLO Taxonomy to provide clarity of the expectations on the critical thinking required was developed. From research, self-assessment has the greatest impact on student achievement (Hattie 2013). This was further augmented by the use of writing frames to provide structure for students to organise their answers to address gaps in the students' writing and meet the standards of assessment.

Introduction

One of the aims of the Geography syllabus is to help our students think critically, analyse and evaluate geographical issues so that they may gain insights and apply the skills to understand current and future challenges both locally and globally. The Geography Assessment criteria require students to answer open-ended questions which are accompanied by a set of level descriptor (LD) assessment rubrics given to teachers. It expects the students to make a stand and critically analyse geographical issues and make a reasoned conclusion. Based on analysis of the students' examination answers, the gaps of critical thinking skills that students appeared to be lacking were identified. The team then developed a set of performance rubric guided by the principles of SOLO Taxonomy, augmented by the use of the writing frames, to increase the students' ability to self-assess the required skills in making an informed judgement when critically analysing geographical issues.

Literature Review

Biggs and Collis (1982) suggest that performance rubrics guided by the principles of SOLO (structure of observed learning outcomes) Taxonomy, provides a simple yet robust way to present to students with a common vocabulary to be clear about the standards expected of them. The standards are in three levels of understanding – surface, deep and conceptual. There is also evidence to suggest that self-reported grades (i.e. self-assessment) have the highest impact on student achievement (effect size of 1.14) as reported in Hattie's (2013)

meta-analysis. Furthermore, Black and William (2001) suggest that students "can only assess themselves when they have a sufficiently clear picture of the targets that their learning is meant to attain".

According to Steve Adderley (2011) who argued that writing frames provide an outline, supported students, helped to scaffold and organise extended writing. The aim of the writing frame is to model the structure of a good answer to a point where they eventually become independent in providing answers that meet the assessment standards. According to National Literacy Trust (2017), writing frames provided a simple way of reducing the pressure on the students to complete the variety of tasks necessary to produce a good essay. Writing frames support the process before students start writing so that they can concentrate on making decisions about what to include and where to include it. Writing frames are beneficial especially for weaker students as they help to cure the 'I don't know how to start' syndrome that often results when students are confronted with a blank sheet of paper.

Methodology

To address the gaps in students' ability to critically analyse geographical issues according to the national assessment standards, the team has chosen 20 students from the Sec 5 (Normal) Academic cohort to conduct a pre-survey to identify the learning gaps. A post-survey was conducted after one term to assess the effectiveness of the intervention. The learning gaps identified include the following: (a) not addressing the issue as stated in the question directly; (b) lack content knowledge and unable to elaborate points; (c) not able to give a balanced view; (d) unable to quote specific examples and (e) not able to make a reasoned conclusion.

The pre-survey data confirmed observations made by the teachers. Hence, the intervention was planned to address the gaps (a)-(e) as detailed earlier. Performance rubrics guided by SOLO Taxonomy and writing frames were adopted to help the students meet the assessment standards.

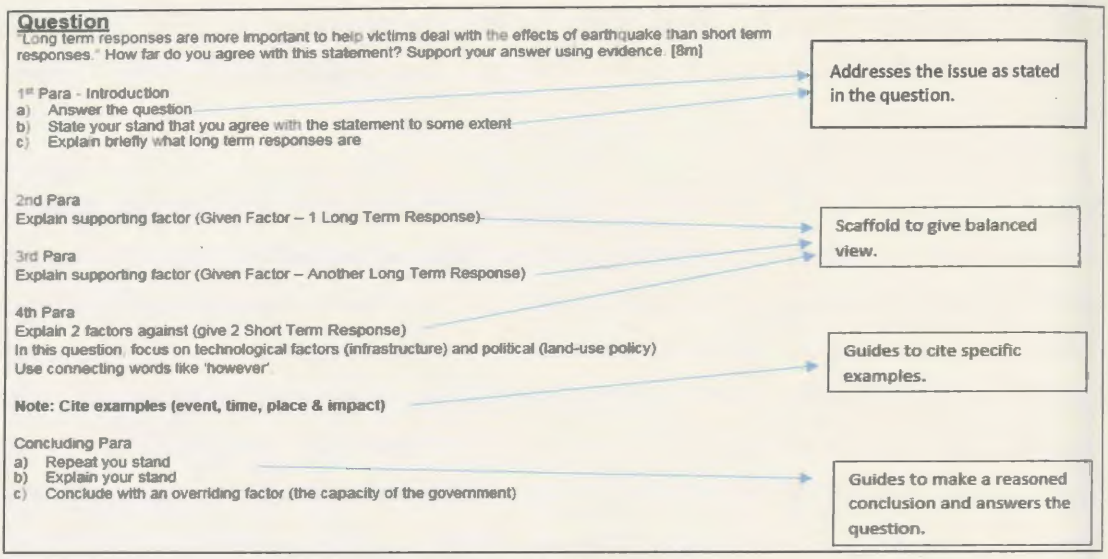


Figure 1: The Writing Frame

The teacher introduced the writing frame to the students as shown in Figure 1 in a systematic and chronological manner on how students may approach a geographical issue critically in 4 neat paragraphs. In Figure 1, using the topic/Question on "Responses to Earthquakes" as the context to illustrate how the question could be answered, the writing frame guides the students on the specificities of the "how" and "what" each paragraph ought to have. In addition, a nested frame *PEEL* (Point, Explanation, Example and Link) was introduced to scaffold students' writing on how the explanation of a factor should be organised.

During the intervention, the writing frame appeared limited as students were still not clear of the expectations of command words like "explain". The performance rubric shown in Figure 2 was conceived to augment the writing frames. For example, at the relational level, the student was guided to know that "clear and logical reasoning" required one to think in terms of providing both sides of the perspectives and arrive at providing a balanced stand. In attempting to "develop sound knowledge", students were asked to provide good examples which should reflect "the event, place, time and impact". The performance indicators described the "logical thinking" expected at each stage, making thinking visible for the students. Clearly, "critically thinking" at the higher relational level had its complexity and was articulated in the meticulously developed rubric. Students followed the performance rubric to navigate their own learning with greater ease as they were made clearer with the expectations. Additionally, the use of SOLO taxonomy helped teachers to clarify our own assumptions of the assessment criteria, unpacked them in a language that our students could comprehend and use them to improve their ability to self- assess, thereby achieving our aims to teach content as well as to develop

individuals with a capacity to thinking critically about the geographical issues that would confront them in the real world.

Students then worked in pairs using the writing frame as a scaffold guided by the rubric. After two sessions of group work and feedback, students used the writing frame for individual work. Subsequently, an additional three more attempts were provided, students appeared to be able to peer assess each other's essays and provided feedback to each other using the performance rubrics. The process was carried out over a term.

Criteria	Relational Level		Extended Abstract
	Emerging: 1-3m	**Meeting : 4-6m**	**Exceeding: 7-8m**
Reasoning (What is a good explanation?)	a) **Explain** given factor **or** 1 other factor mentioned b) **Brief description** of issue c) A **basic answer** that has little development	a) **Explain** given factor(s), **and** 1 other factor mentioned *b)* **Give good reasoning and logic in parts of the answer using PEEL -** Point, Explanation, Example and Link. *c) Given factor well explained using sometimes incomplete PEEL for other factors mentioned*	a) **Explain** given factor(s) **and 2 or more other factors mentioned** b) **Give good reasoning and logic in parts of the answer using PEEL –** (Point, Explanation, Example and Link) c) ***Complete PEEL written** for given factor and 2 other factors*
Example(s)	o Answers **lack example** or other evidence, or it is so sketchy that adds little support to the answer.	o **Some examples** or other evidence will be presented to support answers in at least one place in the answer.	o **Examples** or other evidence to support answers will be **extensive. (Event, Place, Time and Impact)**
Link / View	a) No or little evidence of linkage back to the question. b) Agree (given factor) OR disagrees (1 other factor) and briefly describe the factor.	a) Disagreement or agreement will be supported by appropriate details. b) Both agreement and disagreement are considered, but support is patchy so that the answer is not full.	a) Both **agreement and disagreement** are **considered and well supported**.; and b) **Comparison** of factors using criteria.
Balanced Conclusion	o Able to describe the two stands of the question without relating them to each other.	o Able to analyse the issues showing relationship between factors.	a) Able to analyse the issues **showing relationship between factors** by considering multiple perspectives; b) Able to **critique the issues and come up with a stand.**

Figure 2: Self-Assessment / Peer-Assessment (Level of Response Success Criteria)

Results and Discussion

Teachers observed an improvement made in students' self-assessment and critical thinking abilities as reflected in essays submitted. Comparing the pre and post intervention survey results, there was an overall improvement in students' perception of their ability in narrowing

the gaps presented in the pre-survey. Figure 3A shows the rank order of the areas for improvements from the highest to the lowest.

Survey Stems	Yes (Pre)	No (Pre)	Yes (Post)	No (Post)	Remarks
1. Do not have enough points to elaborate the factors.	86%	14%	33%	67%	Vast improvement (55%)
2. Examples are very simple, not specific.	67%	33%	46%	54%	Great improvement (21%)
3. Cannot explain in detail.	60%	40%	46%	54%	Improvement (14%)
4. No conclusions.	20%	80%	6%	94%	Improvement (14%)
5. Forget to give both sides of the argument.	27%	73%	13%	87%	Improvement (14%)
6. Lop-sided descriptions for e.g. Write a lot for supporting a factor and only 1-2 lines for the argument against the factor.	53%	47%	40%	60%	Slight Improvement (13%)

Figure 3A: Results of Pre and Post Survey

Generally, students reflected that they had "*more points to elaborate the factors*" (55% improvement) as they were more aware of what kind of elaborations were required and they knew how to go about presenting them. Students also perceived that they were better able to cite specific examples (improvement of 21%) when guided by the writing frame and rubrics to include details such as "*Event, Place, Time and Impact*" (refer to Figure 2).There was also a significant improvement observed in how conclusions were being presented in their arguments. Before the intervention, students wrote a more generic unsupported conclusion (refer to Figure 3B).

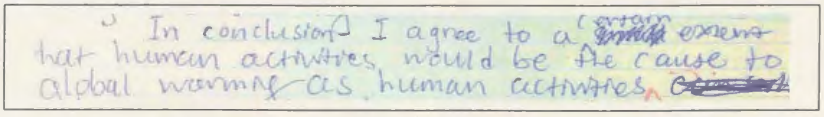


Figure 3B: Samples of student's work - (Before)

However, after the intervention, the conclusion written by students guided by the rubrics had shown an improvement in the quality of reasons presented (refer to Figure 3C) as the conclusions now considered different perspectives before arriving at a balanced view point. Students' increased awareness of different perspectives is seen in Figure 3C.

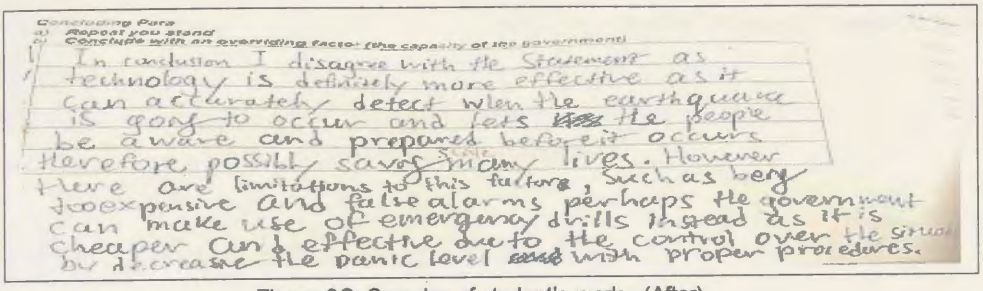


Figure 3C: Samples of student's work - (After)

Thus, the introduction of performance rubrics and writing frame supported students' development of critical thinking skills in a visible way with clarity. However, there was a need to pace the introduction of rubrics and writing frames to lessen the possible cognitive overload. Time was needed to explain how the writing frame and performance rubrics were to be used in addition to the teaching of Geographical content to the students. However, the teaching of skills like critical thinking has been also one of the aims of Geography syllabus, and hence it has to be meaningfully and intentionally put in place.

Conclusion

The aim of this project is to help students approach geographical inquiry in a systematic and meaningful way with considerations for the complexity of the thinking process as well as the vast amount of content expected of the students. The results of this project suggested that the gaps identified were addressed quite effectively. This is evident from the perception survey of the students and the observations of the teachers on the students' work, suggesting strongly that the students' ability to self-assess their level of critically thinking has heightened, pacing them for higher achievements both academically and in life.

References

Black, P., & William, D. (2011, November 06). Inside the Black Box. Retrieved August 10, 2017, from http://weaeducation.typepad.co.uk/files/blackbox-1.pdf

Burden K. (2011, October 21). Writing Frames. Retrieved August 10, 2017 from https://www.iss.k12.nc.us/cms/lib4/NC01000579/Centricity/Domain/3015/Frames%20Article%20with%20Content%20Examples.pdf

Hattie, J. (2013). Visible Learning: A Synthesis of over 800 Meta-Analyses Relating to Achievement. Retrieved August 10, 2017, from https://pdfs.semanticscholar.org/2392/2d3e21a8c447bf95c18dacf630e6ce45eea3.pdf

Enhancing Inference Skills Through Peer Assessment

Jason Seng Yang Sun
Tan Wei Nah
(Humanities Department)

Abstract

For this project, we are adopting peer assessment as an intervention strategy to enable students to improve their ability to make valid inferences from political cartoons. This project was conducted on a Secondary Three Express and a Secondary Three Normal Academic History class. It embraces ICT by utilising Google Form and Google Site as peer assessment tools to deepen students' understanding of the marking scheme for inferential questions. The success of the project is measured by comparing the pre-intervention and post-intervention test results of students who underwent the study.

Introduction

Based on our observations, our students are generally weak in making inferences from political cartoons. They have a tendency to describe instead of inferring from the source. Previous practice was for the teacher to go through the answers using Level of Response Marking (LORMs). In this process, students are not explicitly trained to assess their peer's work when teacher gives feedback on their answer. This paper will illustrate the process of our project, and the conclusions we have drawn about the effectiveness of peer assessment as a pedagogical strategy to bridge the learning gap students experience. This will help them secure the higher marks for inferential source-base questions (SBQ).

Students doing their work on Google Sites.

Literature Review

Peer assessment is often described as an evaluation method, where individuals evaluate each other based on certain criteria (Falchikov, 1995). This project utilises anonymous sample responses from students to enable the student assessors to do their peer assessment using Google Form with their identity remaining unknown to the students being assessed. Research

demonstrates that names of both the evaluator and person evaluated should be kept anonymous during the peer assessment process (Dochy & Sluijsmans, 1999). Anonymity will enable the evaluator to be more comfortable providing authentic feedback, and prevent biasness in his critique of his peer's work.

Our project teaches students the marking criteria to help them understand what is expected to achieve success, and where they fall short if they are unable to achieve the higher levels. This is based on Bromley's proposition that "effective feedback involves being explicit about the marking criteria", and "it is important that teachers give students examples of how they can close the gap...they must explain ways in which it can be improved". "Peer assessment can also help students to self-assess because reading each other's work provides students with a similar kind of opportunity with that which teachers are afforded at standardisation meetings. It helps them through exemplification, to engage with what work at a particular level or grade looks like and also enables them to see how a piece of work might be approached. Seeing how someone else has tackled the same task helps students to reflect on their own performance" (Bromley, 2012). In line with this conclusion, the task where students are required to assess the work of their peer by assigning the level and mark enables students to learn from the good points and areas of improvement from the feedback provided for their peers' answers.

"Student-to-student verbal feedback...enables students to analyse work objectively and motivates them to take control of their own progress". "Self and peer assessment enables students to see the progress they are making. Students can begin to work out for themselves how to improve their work (Bromley, 2012). Our peer assessment task hence engaged students in a collaborative dialogue with each other and their teacher in discovering what is required of them to improve the quality of their answers. The pre-test and post-test results were recorded and analysed to determine whether our intervention strategy was successful in improving students' results. To assess the retention of their learning, an additional test was administered about 2-3 weeks after the post-test.

Methodology

The project started in Term Two Week One. The target group of students was the Secondary Three Express and Secondary Three Normal Academic Elective History students. Before the first lesson, teachers administered a qualitative survey to find out students' understanding about the steps involved to answer inference questions. For the first lesson, the students were

given an inference question to do (on the Google Site - https://sites.google.com/view/bpsstalin), and the teachers marked their work.

During the second lesson, the teachers taught their students how to assess the answer to inference questions rubrics adapted from LORMS (Figure 1) guided by SOLO Taxonomy.

Quality of response A: Make 2 valid inferences (A): Copy source evidence / describe the source without making any inferences. (B): Write down **2 inferences** made from the source, not supported by evidence. (C): Explain why **evidence** from the source support your **inferences.**	1 Mark **(Unistructural, Multistructural)** **(A)** **Copy from the source / Describe the source.** **1 mark**	2-3 Marks **(Relational)** **(B)** **2 valid inferences, unsupported.** **2 marks:** **1 valid inference, unsupported.** **3 marks:** **2 valid inferences, unsupported.**	4-5 Marks **(Extended Abstract)** **(B)+ (A) + (C)** **2 valid inferences, supported and explained.** **(B):** Write down two **inferences** made from the source. + **(A):** Provide **evidence** from the source that supports your **inferences.** + **(C):** Explain why **evidence** support your **inferences.** **4 marks: 1 valid inference, supported and explained.** **5 marks: 2 valid inferences, supported and explained.**
Examples	Eg: There are a lot of dead bodies in the poster. 7 million were killed by Moscow. There is blood flowing in the background.	Eg: I can infer from Source A that Stalin was an uncaring/harsh/cruel leader. Eg: I can infer from Source A that Stalin's collectivization programme was not beneficial to the people/a failure.	Eg: I can infer from Source A that Stalin was an uncaring/harsh/cruel leader.. **(Inference)** This is supported by Source A, which shows me that there were a lot of dead bodies. It was also stated that "7 million starved by Moscow" **(Evidence)**. This tells me that Stalin deliberately deprived them of food causing them to die from hunger. Thus, Stalin was an uncaring/harsh/cruel leader because collectivization had resulted in massive death from hunger in Ukraine **(Explanation)**. Eg: I can infer from Source A that Stalin's collectivization programme was not beneficial to the people/a failure. **(Inference)**. This is supported by Source A, which states that Ukraine was the bread basket of Europe **(Evidence)**. This means that before collectivization, food was in abundance and the citizens of the Soviet Union did not have to starve. However, after collectivization, many starved to death. Thus, Stalin's collectivization programme was not beneficial to the people/a failure because it worsened the lives of citizens of the Soviet Union. **(Explanation)**.

Figure 1: SOLO Taxonomy-Guided Rubrics

Students were then tasked to assess the sample answers of their fellow classmates using the SOLO taxonomy-guided rubrics. The process is described below:

1. Teachers uploaded 3 sample answers and the SOLO taxonomy-guided rubrics to the Google Site prior to the lesson. Sample answers comprised one good, one average, and one weak response.
2. Students were tasked to assess the first sample. They were tasked to use Google Form to indicate the level and mark that each sample should get, stating the reasons why they allocated the marks (Refer to Figures 2 and 3 for a sample of the students' responses). Students could also recommend improvements to the answers in the comment box. The purpose of allowing students to rationalise their awarded level and mark for their peers' answer was to enhance their learning, and therefore achieve the highest level of thinking possible.

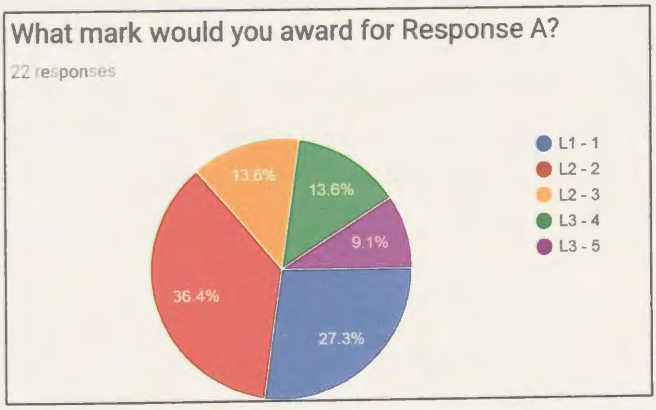


Figure 2: Pie chart illustrating students' choice of the Level and marks to be awarded

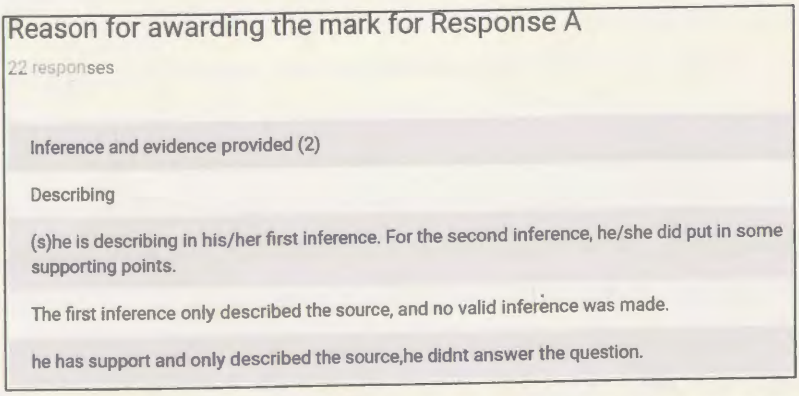


Figure 3: Reasons provided by students for selecting the level awarded in their peer assessment

3. The collated responses in Figures 2 and 3 revealed that some students had misconceptions about the application of the rubrics in peer assessment. Teachers gave task level feedback – to address the learning gaps revealed by the explanations submitted by students in the Google Form. In task level feedback, we asked students to identify specific examples or quotations to link to the source and to support their inference.
4. Students repeated the steps outlined above to assess the second and third sample answers to reinforce what they have learnt.

A perception survey was given at the end of the project to gauge the usefulness of the intervention strategy. An inference test consisting of two inference questions was also given two weeks later to confirm whether students had learnt.

Results and Discussion

Students generally showed an improvement in their source-base question (SBQ) inference skills. For example, 70% of students from 3A1 got a higher mark for their post-test compared to their pre-test. For 3E History Elective students, 50% of the students got a higher mark for the post-test compared to the pre-test. For the other 50%, their results remained unchanged. For the inference test which was given two weeks later, 100% of the 3E students and 80% of the 3NA students passed the test. This confirmed that students retained what they had learnt from this project.

A closer analysis of the students' marks showed that the weaker students who initially got L1/L2 in their pre-test were the ones who showed the most significant improvement in the post-test. The teachers were expecting a higher percentage of students to show improvement after intervention. However, this did not happen; instead half of the Secondary Three Express students did not show significant improvement in their results. It is possible that weaker students may not have understood the requirements of the SBQ inference question, and the exercise has enabled them to gain a better understanding of the question requirements. Hence, they were able to attain better mastery of the answering technique to secure the higher levels for subsequent tests. The middle and higher ability students who were already familiar with the question requirements did not have much improvement in their marks because their challenge is in picking out the appropriate inference or evidence to answer the question. Based on this observation, the team has gone on to develop and unpack the rubrics further so as to

better guide the students to move towards a higher level of thinking. Figure 4 below shows the revised rubric.

CONCEPTS	CRITICAL THINKING SKILLS – ANALYSIS; LOGICAL THINKING CAREFUL STUDY OF SOMETHING ABOUT ITS PARTS AND HOW THEY ARE RELATED TO EACH OTHER		
	Approaching	**Good**	**Outstanding**
Critical analysis on Issue Eg. Stalin and life under his rule	**1. Able to identify issue (topic).** **2. Able to identify that the topic is related to Stalin's rule and the negative impact of collectivization by copying from/ describing the source.** E.g. Source A shows me _____. **(First description)** Source A also shows me _____. **(Second description)**	**1. Write at least one key inference of what the source is trying to say from details provided – e.g. people, quotations.** **2. Link the key inference to answer the question – by applying content knowledge.** **3. Support key inference with evidence selected from the source.** E.g. I can infer from Source A that _____. **(First inference)** This is supported by _____ **(First evidence)** I can also infer from Source A that _____. **(Second inference)** This is supported by _____. **(Second evidence**	**Able to identify key inferences (at least two more) supported with details/evidence from the source while making logical connections (explain) to the question given, relating your reasons to content knowledge (context – issue given)** E.g. I can infer from Source A that _____. **(First inference)** This is supported by _____ **(First evidence)** This means that _____ **(First explanation).** I can also infer from Source A that _____. **(Second inference)** This is supported by _____. **(Second evidence)** This means that _____ **(Second explanation).**

Figure 4: The Revised Performance Rubric Focusing On Skills Instead Of Exam Marks And Demands of LORMS

The performance rubrics when unpacked well aim to reveal the success criteria clearer to the students, thereby translating the standards into clearer behavioural expectations for the students. The revised set of rubrics has also broadened the teachers' view on how to teach to the skills instead of limiting ourselves to the use of exam rubrics which was provided by SEAB for teachers to know how the marking is done. In this way, the students will also find this more meaningful to see that the subject is teaching a life skill on how to analyse, synthesize or evaluate issues rather than merely answering exam questions.

Conclusion

Our project demonstrates that peer assessment as an intervention strategy is most effective for low ability students who were initially securing L1/1-2 marks based on LORMS marking. They were able to move beyond L1 to secure the higher levels which required them to demonstrate that they were at the relational and extended abstract levels of SOLO taxonomy. Mid and high ability students who were already aware of the quality of answer required to achieve the relational level did not have much improvement. Their challenge may be in application to demonstrate that they have achieved the extended abstract level, which requires

a different intervention strategy beyond the scope of this project. Moving beyond this project, the team is exploring the possibility of creating differentiated assessment rubrics to cater to students of varying abilities within the History classroom. Our differentiated assessment rubrics will serve as a tool to motivate low ability students to achieve better results by rewarding their ability to move towards higher levels of thinking, and stretching mid to high ability students to move towards higher levels of thinking beyond what is demanded in standardized tests.

References

Dochy, F. J. R. C., Segers, M., & Sluijsmans, D. (1999). The use of self-, peer and co-assessment in higher education:A review. *Studies in Higher education, 24*(3), 331-350.

Falchikov, N., & Goldfinch, J. (2000). Student peer assessment in higher education: A meta-analysis comparing peer and teacher marks. R*eview of educational research, 70*(3), 287-322.

Active Learning Through ICT-Enriched Lessons Assessed Using SOLO Taxonomy

Ng Joon Yong
Chan Jie Yong
Sahu Pooja
Chanel Kang Yiling
Arion Lai Jia Hui
(Craft and Technology Department)

Abstract

Active learning is a process where students focus on shared learning objectives and engage in thinking through discussion as they construct knowledge (LPET, 2016). Craft and Technology (C&T) department uses Google Site as a platform to design learning experiences, plan for students' demonstration of learning, monitor and provide feedback for students' active learning. Structured Observed Learning Outcome (SOLO) taxonomy was used to design rubrics to assess students' learning. After the implementation, the teachers reflected on the meaningfulness of the use of technology, in particular, Google Site with reference Technological Pedagogical Content Knowledge (TPack) rubrics. Perceptions on the meaningfulness of the use of technology differs with students' level of experience in technological knowledge. The attempt to use SOLO taxonomy to craft assessment rubrics has yield clarity in expectation of the desired outcome.

Introduction

Craft and Technology (C&T) department consists of Art, Design and Technology and Food and Nutrition. These are coursework subjects where alternative assessment form a major part of the summative assessment. The use of Google Site not only allows students to work at slightly different pace, but also allows the resources to be used for future reference.

Currently, rubrics were used to assess students' learning summatively mainly by the teachers. There are attempts by teacher to help students understand the expected outcome by giving students success exemplars. However, there is a need for teachers to describe success criteria and outcome more explicitly so that there is a common understanding of the different level of achievement.

Literature Review

Design of active learning with technology

The design of active learning with technology is guided by a series of questions where students and teachers have their roles to play. Table 1 shows an illustration of how teachers and students can play their roles in activate learning, promote thinking and discussion, monitor and provide feedback of their learning and demonstrate their learning through digital product such as google document.

Active Learning Process	Role of students	Role of teacher
Activate Learning How will students' focus and interest be oriented towards the learning objectives?	• Set own or group learning goals • Connect prior knowledge to the task	• Clarify learning objective and success criteria • Design trigger activity to elicit students' prior knowledge
Promote Thinking and Discussion How will students be engaged in thinking? What skills and processes will students perform? How will students build on their current understanding?	• Engage in thinking through discussion, negotiation and meaning making • Use peers' and teacher's ideas and concepts to refine own understanding	• Design tasks to connect, challenge, deepen or extend students' thinking • Provide thinking routines or scaffolds • Get students to share their ideas and concepts • Teacher articulates his/her ideas and concept
Facilitate Demonstration of Learning How will students demonstrate their understanding and new learning?	• Articulate understanding of concepts • Demonstration of skills • Apply learning by creating a digital product	• Design performance tasks for students to apply their learning in various ways
Monitor and Provide Feedback How can students' learning be advanced?	• Provide feedback to peers • Use feedback from peers and teacher to refine own understanding • Reflect on goals and learning process	• Check for understanding using students' works • Give timely and targeted feedback • Provide opportunities for feedback from peers or experts • Ensure learning objectives and success criteria are met

Table 1: Role of student and Teacher in the active learning process (extracted from LPED/ETD MOE, 2016)

Design of rubrics to measure students' complexity of understanding

Biggs and Collis (1982) described the growth of competence in terms of, first, a quantitative acquisition of the components of a task, which then become qualitatively restructured. The different level of achievement can be measured by crafting rubrics with descriptors to a criteria clearly defined. The lesson objectives can be crafted using observable verbs that describe the desired outcomes (Potter & Kustra, 2012). At the uni-structural level, example of verbs to describe the outcome could be "identify", "define", "state". At the multi-structural level, verbs could be "list", "explain", and "describe". At the relational level, students are expected to compare, classify and apply by synthesis knowledge and making connections. At the extended abstract level, knowledge on a particular topic is extend to a larger context where students could create new ideas, make predictions by drawing inference from other topics and so on.

The Use of Tpack to guide teacher in reflections

As reflective practitioners, teachers improve their teaching through reflections of their classroom actions and students' responses. In the area of use of technology to engage students' learning, Koh (2013) used 'The meaningfulness of ICT lesson rubrics to assess pre-service teacher ICT lesson activities with reference to five dimensions: Active, Constructive, Authentic, Intentional and Cooperative. Table 2 shows the rubrics with description of the dimension and standards.'

Dimension	0	1	2	3	4
Active	Students passively receive subject matter from media or ICT all the time	There is sporadic use of ICT tools by students to work with subject matter	Students are using ICT to work with subject matter half the time	There is substantial use of ICT by students to work with subject matter.	Almost all lesson time involves students using ICT to work with subject matter.
Constructive	ICT tools used for transmission of subject matter rather than meaning-making.	ICT tools used to support reproduction of subject matter or convergent knowledge expression by students.	ICT used to support some degrees of divergent knowledge expression by students with respect to the subject matter.	ICT tools used by students to synthesize information in order to construct verbal, written, visual, conceptual or product-oriented expressions of the subject matter.	ICT tools used by students to articulate their personal reflections of subject matter in the form of verbal, written, visual, conceptual or product-oriented expressions.
Authentic	No representations of real-world phenomenon or problems related to the subject matter are presented with ICT tools.	ICT tools used to present examples of real-world phenomena related to the subject matter of students.	ICT tools support students to investigate real-world phenomena or problems related to the subject matter.	A problem associated with a real-world phenomenon related to the subject matter is used to anchor the activity and students investigate the real-world phenomenon with ICT tools in order to propose solutions.	Students represent their personal experiences of the real-world phenomenon/ problem related to the subject matter with ICT tools
Intentional	Students do not use ICT tools to support them in diagnosing, strategizing about or improving their learning gaps of the subject matter.	Students' learning gaps of the subject matter are being diagnosed by teachers or peers.	Students self-diagnose their learning gaps of the subject matter by using ICT tools/resources.	Students use ICT tools/resources to self-diagnose their learning gaps of the subject matter. Thereafter, they are to fix these learning gaps.	Students continually use ICT-based tools/resources to self-diagnose and fix their learning gaps of the subject matter.
Cooperative	No cooperative activity over ICT platforms/tools or ICT tools/platforms are used to share information and resources related to the subject matter but no online discussion occurs.	Students work together either around the computer or through the computer in activities requiring convergent knowledge expressions of the subject matter.	Students work together either around the computer or through the computer in activities requiring some degree of divergent knowledge expression of the subject matter.	Students work together either around the computer or through the computer in activities requiring a large degree of divergent knowledge expression of the subject matter.	Students work together either around the computer or through the computer in activities requiring primarily divergent knowledge expression of the subject matter.

Table 2: Rubrics for assessing meaningful learning with ICT (extracted from Koh, 2013, pp. 893)

Methodology

Participants, method and research question

An interpretative approach is used to answer the research questions: (1) How Google Site and SOLO help teachers and students in the teaching and learning of the subject matters. Semi-structure interviews were conducted and subject teachers' reflections were gathered. For F&N, 15 Secondary 3 Express and 13 Secondary 3 NA students were involved in the study. For D&T, 38 Secondary 2 students were involved in the study and for Art, 21 Secondary three express, 3 NA and 3 NT students were involved in the study.

Designing the learning using Google Sites application

Google site is a free application that is part of Google's Apps for Work. This application can be used collaboratively by teacher to create engaging, high-quality sites for the students. The sites can be viewed easily on almost every screen, from desktop to smartphone.

The two key considerations for the design of the learning interface were as follows: (1) Easy navigation by students to the resources needed and (2) Easy use by the teachers to conduct lesson using the site. The interface of the site is thus organised by class, followed by lesson or topics.

The department crafted website using google-site to help students to organise, demonstrate and discuss their learning of D&T, Art and F&N. The link of the websites are as follows: (1) For D&T www.tinyurl.com/bpss-dt and (2) for Art www.tinyurl.com/bpss-art and (3) for F&N www.tinyurl.com/bpss-fnn.

Assessing learning through crafting of rubrics guided by SOLO taxonomy

Rubrics were crafted for the assessment of performance. The criteria for assessment was explained and elaborated so that students understood the terms used. For example, the criterion for 'Aesthetic Qualities & Composition' was about the use of art elements and principle of design to make judgement to an idea. Description of observable outcomes at each standard was based on quantitative accusation of knowledge at the uni-structural and multi-structural level using term such as little and adequate as well as verb such as list, recognise and identify. It is then followed by descriptor of in-depth understanding where students are expected to draw connections among knowledge and skill taught. An example is shown in Table 3.

D&T rubrics SOLO Taxonomy Criteria	Uni-structural "I have one idea" 1 – 3 marks	Multi-structural "I have many ideas" 4 – 5 marks	Relational "I can link the ideas together" 6 – 8 marks	Extended Abstract "I can think of new ideas using methods beyond what was taught" 9 – 10 marks
Ideation using mood board and SCAMPERS	One exploration of ideas during one component of SCAMPER (e.g substitute) or making some reference to mood board	Exploration of ideas using various components of SCAMPER and make reference to mood in term of function, aesthetic, construction, material and size (design factors) in isolation	Exploration of ideas using various components of SCAMPER and make reference to mood board in term of design factors. Develop ideas by considering these design factors in totality to achieve a functional or aesthetically appealing product.	Exploration of ideas using various components of SCAMPER, make reference to mood and beyond (such as research data) to thoughtfully and thoroughly consider the design factors. Developed idea considered these design factors in totality to achieve a functional and aesthetically appealing product that sustain user interest.

Table 3: Assessment criteria with level of attainment described using SOLO Taxonomy

Results and Discussion

Teacher's reflection on the design of learning

Reflections against Tpack was conducted for teacher who are involved in the design of the sites and implemented at least one lesson using the site. Teachers who are new to google sites focused on how the site can serve as a resource platform with YouTube videos, slides and worksheet embedded on the site. Teachers also attempt to set online quiz and use widget such as Quizlet to assess students understanding within the lesson. Teachers with experience in web design use the platform for students to discuss and work cooperatively within the lesson where students post their work for criticism.

SOLO helped the teachers to plan their lesson from uni-structural (where they learn how to define the technical term) to relational (where they apply their knowledge and conduct their practical work). Resources were directed to students for them to extend their learning beyond the topic. This includes on how to search for information that explain in greater depth on what was taught in class. Teachers then work with the students to evaluate the information found in the internet and help them explain, elaborate or clear misconception on what was taught.

Rubrics were crafted at task level as well as competency level. That is, at task level, rubrics are crafted to measure specifically to a particular task such as the use of Computer aided drawing. At competency level, rubrics are crafted that can be used across task or project, which measure the students competency in the construct desired which usually consists of a few variables or criteria.

Students' feedback on the use of Google Site and SOLO in learning

The use of google site helped students to access information on-the-go since google site has a mobile friendly interface. It helped students who missed the lesson to work online when instruction were clear to acquire factual and procedure knowledge. When "expert" exemplars (work done by professional or teacher) were given and "novice" exemplars (work done by their friends) were posted, students get a good sense of the scope of work expected. The rubrics helped the students to stay focused on what is expected in order to achieve a higher band. This also motivated them to invest effort needed to achieve the required attainment.

Conclusion

The use of SOLO helped teacher and students to clarify their expectations and direct their effort respectively through explicit observable outcome at different level of achievements. This

helped teachers to plan their lesson and scaffold learning. While TPACK rubrics was introduce at the beginning of the project to teachers with the intent to achieve higher standards in each dimension, teachers with higher level of technological knowledge seems to be more able to focus their energy on pedagogical content knowledge to create meaningful ICT lesson.

Based on the reflections from teachers, TPACK rubrics were modified by integrating some of the dimensions to the active learning process for use in the future. The active dimension is modified to activate learning which describes the standards for sustaining student's interest rather than the time engaged in the use of ICT. The constructive and cooperative dimensions were combined to from 'facilitate demonstration of learning through authentic task'. Intentional dimension is modified into 'monitor and provide feedback'. Table 4 shows an attempt for teachers to reflect against their learning by stating examples of standards that can be achieved.

Dimension	0	1	2	3	4
Activate Learning	Objective presented to students without trigger activity	Objective presented with media to arouse students' interest	Trigger activity set to arouse students curiosity to derive learning goals	Trigger activity arouse students curiosity to derive learning goals aligned to learning objective	Trigger activity sustained students' interest in pursuing learning goal with reference to learning objective
Promote thinking and discussion	Teacher uses ICT tools for transmission of subject matter *such as watching video or reading slide online*	Teacher uses ICT tools to help students reproduce subject matter with discussion for surface learning	Teacher uses ICT tools to support students make connection of subject matter with own understanding through negotiation and meaning making	Student use ICT tools to challenge the underlying assumptions of the subject matter through self-structured discussion	Student use ICT tools to refine subject matter through self-structured discussion
Facilitate demonstration of learning through authentic task	No representation of real-world task for student to demonstrate skill learned	Use ICT tools to present example of real-world context related to students experience	Use ICT tools to investigate real-world context related to subject matter	Use ICT tools to propose solution to scoped problem related to subject matter	Students mirrors professional views in real-world context or solving real-world problem related to subject matter
Monitor and feedback	Students did not use ICT tools to elicit and interpret information to improve their learning.	Teacher uses ICT tools *such as google doc* to elicit and interpret information to provide timely feedback to improve learning	Teacher uses ICT tools and learner as resources *such as peer feedback* to improve learning	Student assesses own learning gap using ICT tools *such as online quiz or seeking trusted sources* to check their understanding	Student assesses own learning gap using ICT tools and improve their learning to achieve the learning objective

Table 4: Rubrics for teachers' reflection on the active Learning Process meaningful learning with ICT

References

Koh, J. H. L. (2013). A rubric for assessing teachers' lesson activities with respect to TPACK for meaningful learning with ICT. *Australasian Journal of Educational Technology, 29*(6).

Learning Partnership in Educational Technology Branch (LPET) MOE (Ministry of Education) (2016). Active Learning Processes Version 1.0_20Apr2016: Designing learning with technology begins with thinking about how to get students actively engaged in learning. Singapore. [PowerPoint slides] retrieved from http://preview.tinyurl.com/ activeleaarningetd

Potter, M. K., & Kustra, E. (2012). A primer on learning outcomes and the SOLO taxonomy. Centre for Teaching and Learning, University of Windsor. Retrieved from http://www1.uwindsor.ca/ctl/system/ files/PRIMER-on-Learning-Outcomes.pdf

Holistic Outdoor Education Through The Place-Based Learning Approach

Kelvin Chong Chee Leong
Adam Liew Yee Hoong
Tan Chee Beng
Lawrence Lim Boon Huat
(Physical Education Department)

Abstract

Outdoor Education (OE) was introduced to the Physical Education (PE) syllabus in 2014 to spark our students' spirit of adventure, and develop resilience and responsibility. The focus now, is on designing lessons that will bring about the Joy of Learning.

Following the PE department review of our approach to OE in 2016, we have formulated two strategies to enhance our teaching and learning of OE. Firstly, the mere acquisition of knowledge and skills was superficial and needed a context for the students to find relevance beyond the classroom. Secondly, the students need to know exactly what they are learning and how to do better.

Hence, we decided to explore the Place-Based Learning (PBL) Approach for our students to acquire map-reading and orienteering skills, while developing a deeper sense of connectedness to, empathy for, and knowledge of the area surrounding Bishan Park Secondary School. To this end, the students will study the landscape through these three lenses – physical, ecological and cultural. By using an Assessment Rubric based on the Structured Observable Learning Outcomes (SOLO) Taxonomy, the teachers would be able to clearly specify the success criteria and plan for deep learning in their students through Assessment for Learning (AFL) pedagogies, such as self / peer assessment.

We have witnessed through the pilot Sec 3 Outward Bound Singapore (OBS) and Sec 2 Adventure camps this year how the PBL approach brought about greater student engagement through on-ground interaction with their environment. We are fully convinced that we have embarked on the right track to make OE more holistic and relevant for our students. The following sections document our research on PBL, its application to our environment and the use of the SOLO Taxonomy to bring about clarity in learning.

Introduction

Place-based education is the process of using the local community and environment as a starting point to teach concepts in Language Arts, Mathematics, Social Studies, Science, OE, and other subjects across the curriculum. Emphasising hands-on, real-world learning experiences, this approach to education increases academic achievement, helps the students develop stronger ties to their community, enhances their appreciation for the natural world, and creates a heightened commitment to serving as active, life-long contributing citizens.

Community vitality and environmental quality are also improved through the students' active engagement of local citizens, community organisations, and environmental resources in the life of the school.

The essential characteristics of place-based education are that it comes from the particular attributes of a place, is multidisciplinary and experiential, reflects a philosophy broader than "learn to earn", and connects place with self and community. In contrast to work-oriented goals of schooling, place-based education prepares people to live and work to sustain the places they inhabit and to participate actively in democracy. It is a simple proposition, really, of bringing education back into the neighbourhood, and achieving local physical, ecological and cultural sustainability.

Literature Review

In his introduction to the first book specifically focused on the pedagogy, Place-Based Education: Connecting Classrooms and Communities, Lane-Zucker suggests that PBL might be characterised as the pedagogy of community, the reintegration of the individual into his/her immediate environment and the restoration of the essential links between a person and his/her place. Place-based education challenges the meaning of education by asking seemingly simple questions – Where am I? What is the nature of this place? What sustains this community? It often employs a process of re-storying, whereby students are asked to respond creatively to the stories of their environment so that, in time, they are able to position themselves, imaginatively and actually, within the continuum of nature and culture in that place. They become a part of the community, rather than a passive observer of it. This lends itself naturally to OE and more specifically, navigation and map reading.

In the research paper: Outdoor Education, Opportunities provided by a Placed Based approach published in 2008 by Dr Mike Brown from the School of Education, The University

of Waikato, he calls for educators to consider the role that 'Place' has in OE. It suggests that greater emphasis and acknowledgment be given to 'place(s)' and how they may help students make sense of both their personal and communal identities. It also provides evidence that OE does not necessarily need to be 'high impact' adventurous activities, instead suggesting that we should seek to develop a modest pedagogy which acknowledges our relationships with place(s) as a way to understand who we are, how we connect to others and how we both give and take meaning from the places in which we live and learn. This supports and confirms our efforts towards designing and leveraging on effective pedagogy during PE lessons – which are typically 50 minutes – to provide a quality and meaningful OE experience for our students.

Methodology

Some of our objectives are for our students to learn how to estimate distances between features on a map, to identify key features on a map through colour codes, use thumbing to identify features, and discover and understand the different types of flora in the school.

To this end, we conducted theory and practical exercises on map reading, taught our students how to identify the various types of plants in their area of the map given and how they are represented on the map. Groups then shared their findings. In addition, the students also used the assessment rubric provided to gauge their own level of understanding and reinforce learning outcomes.

For the students to be able to estimate the actual distance travelled versus distance on map, we carried out pacing practices to identify a student's individual pace using single or double pacing methods followed by group discussions on how to identify the factors affecting accuracy of distance. (Note: Studying the method and finding the individual personalised pacing (distance) give students a better understanding of one's physical limitations and assist each student to come up with his own pacing methodology).

Then, using the pacing and map reading techniques learnt, the students navigate to a location within the school, all the time keeping in mind how their school values should be exercised to keep the school environment clean and green.

Our students were also taught how to identify a location on the map using the Military Grid Reference (MGR) and to gain awareness of the flora and fauna in the Bishan-Ang Mo Kio Park through theory and practical exercises on MGR (within school) to locate an area on a

map using the grids on the map. They also learned to identify the different types of plants and animals in their area of the map given and how they can be represented on a map. The groups then shared their findings and had a discussion on why the environment of the Bishan-Ang Mo Kio Park has attracted these animals. The Assessment Rubric provided was again applied to gauge their level of understanding and reinforce learning outcomes.

For the students to learn to identify the parts and features of a compass, to use a compass to navigate for direction, and to understand and appreciate the effects of human actions on the environment, theory and practical exercises on Compass Reading (Bishan-Ang Mo Kio Park) were conducted, and then they were tasked with locating an area in the map using the compass and a set of instructions. (Note: By now, students have a better understanding of map reading, navigation using grid system and compass; which will equip them with additional navigational skills to suitably handle different scenarios).

They concluded with a discussion which enabled them to identify actions that are disruptive/ destructive to the Bishan-Ang Mo Kio Park and how this can be prevented from happening to preserve this environment

The final activity saw our students embarking on the Bishan-Ang Mo Kio Park Orienteering exercise, where they formed groups to navigate between designated checkpoints in the park. These selected checkpoints incorporated all the unique features of the Bishan-Ang Mo Kio Park, such as the lily pond, futuristic playground, water playground, etc. On completion of this, the groups reflected and discussed the impact of human activities on the flora and fauna in the Bishan-Ang Mo Kio Park. They also shared how the residents have benefited from the new landscape of Bishan-Ang Mo Kio Park and how they can use the Bishan-Ang Mo Kio Park to educate BPSians on eco-literacy. Again, the Assessment Rubric then provided a means to gauge their level of understanding and reinforce learning outcomes.

SOLO Assessment Rubric for Outdoor Education				
Criteria	**Pre-uni-structural** *(Emerging)*	**Multi-structural** *(Developing)*	**Relational** *(Achieving)*	**Extended Abstract** *(Exceeding)*
<u>Sense of place (Physical)</u> • Read and draw topographical maps. • Navigate with compass and bearings to locate a landmark on a topographical map. • Estimate distances using the pacing technique.	Identify a few features on a compass, with unclear relevance. Identify a few features on a topographical map with unclear relevance. Estimate short distances using own pace. (Up to 200m)	Identify most or all features on a compass, with unclear relevance. Identify most or all features on a topographical map, with unclear relevance. Estimate longer distances using own pace. (500m or more)	Use compass reading skills and pacing techniques with a topographical map (using landmarks and coordinates) to navigate accurately, on familiar grounds.	Use compass reading skills and pacing techniques with a topographical map (using landmarks and coordinates) to navigate accurately, a new or unfamiliar environment.
<u>Sense of place (Ecological and cultural)</u> • Understand the relationship between people and environment.	Identify key people/ objects in a given environment. May miss out finer details.	Identify most or all key people/ objects in a given environment.	Explain and analyse in detail how people have an effect on the environment they are in and how they interact with each other.	Explain and analyse in detail how people affect the environment they are in. The evaluation is thorough and logical, with considerations of implications and consequences.
• Demonstrate care for self, others and the environment.	Describe or list a few facts about a place. May miss out finer details.	Describe or list most or all the facts about an environment.	Shows awareness of how fragile ecological and cultural balance is in a familiar environment.	Able to transfer this learning to another context or environment.

Manage and assess risks (Physical and ecological) • Identify hazards and manage risks of an environment with the 'W checklist' and suggest control measures to protect self and others.	Identify a few hazards of an environment. May be incomplete or trivial.	Identify most or all hazards of an environment but control measures suggested are insufficient or ineffective.	Identify all hazards present in a familiar environment. Compare and contrast hazards and recommend effective and feasible risk control measures with comprehensive follow-up actions.	Given a hypothetical scenario, analyse and evaluate hazards posed by environment or people. The evaluation is thorough and logical, with consideration of implications and consequences. Able to transfer this learning to another context or environment.

Results and Discussion

Six lessons were carried out to equip two Secondary 3 classes (3E2, 3E3) with the prerequisite map-reading and orienteering skills needed. Students of mixed interests were grouped together. The students started off relatively well in map-reading where they navigated effectively to the checkpoints in the familiarisation exercise in school before they proceeded to the more advanced stage of navigating in the Bishan-Ang Mo Kio Park .

Map Reading

The students enjoyed getting to know and understanding the various parts of the school ecologically, and were pleasantly surprised to discover banana trees and sugar cane plants in the school. The lessons also gave them an opportunity to converse with the keepers of the plants and also made them realise that the places they live in are not merely physical landscapes; there are also people living in them.

Orienteering outside the school compound was a challenge to some students- especially the girls; as the area covered was much bigger and they were physically exhausted. However, on a positive note,

Discussion on route to checkpoint

the students became more appreciative of the park wildlife, such as the fishes, otters, wild boars, squirrels and migratory birds.

Identifying the landmark

All in all, we felt that the lessons could have been better if we had included oral research; where students would interview the park users - mainly elderly folks, to connect the young with these senior citizens as this will forge a better understanding and greater empathy within our community.

Conclusion

This project has made explicit what we want our students to achieve through OE. We need to be reflective practitioners and to always use research to strengthen our pedagogy. Although we did not complete all the lessons planned, the sessions we had saw a marked improvement in student engagement, which in turn provided a wonderful learning environment. Leveraging on the BPS lesson structure, we ensured that students' activity time was maximised with minimum teachers' talk time. Moving on, we intend to explore the use of the four levels of feedback to enhance our interaction with the students to improve their engagement, performance and achievement.

The lessons learnt and experience gained here will eventually be applied to the teaching of other subjects or games in PE. We hope that by sharing our research and findings, you will be inspired or convinced to explore PBL in your respective subject areas.

References

Brown, M. (2008). Outdoor education: Opportunities provided by a place based approach. *New Zealand Journal of Outdoor Education, 2*(3), 7-25.

Sobel, D. (2004). Place-based education: Connecting classroom and community. *Nature and Listening, 4*, 1-7.

Woodhouse, J. L., & Knapp, C. E. (2000). Place-Based Curriculum and Instruction: Outdoor and Environmental Education Approaches. ERIC Digest.

Using Rubrics Guided by SOLO to Enhance Relationship Management

Wong Hei Man
Alice Yeo Ai Lee
Jason Seng Yang Sun
(Character and Citizenship Education Department)

Abstract

The Social Emotional Competency Inventory is used as a profiling tool to understand the social and emotional (SE) needs of the students. The skills that will help bridge the gap are than identified and lessons and programmes are subsequently designed to address these needs. Tan (2013) advocate that the design of assessment task based on the clarity of standards and providing quality feedback will bridge the gap of what students are expected to perform. With regard to SE needs of students, the aim of the curriculum is to enable students to feedforward the skills that they acquire in school into the community to be contributing citizens in the future.

In the design of the intervention lesson to bridge the gap, the principles of SOLO Taxonomy was used to give the students clarity in the standards expected of them.

Introduction

Social and Emotional Learning (SEL) is an umbrella term that refers to students' "acquisition of skills to recognise and manage emotions, develop care and concern for others, make responsible decisions, establish positive relationships, and handle challenging situations effectively" (MOE, 2017).

In order to achieve our school vision of "Learning School, Caring Community and Contributing Citizens" there is a need for our students to be anchored on sound values and acquire social emotional skills to manage self, relate to others positively and make responsible decisions. This is primarily done through the inculcation of values and Social-Emotional (SE) Competencies through school-wide implementation of Character and Citizenship Education (CCE) Programmes. (Form-Teacher Period, CCE Lessons, Morning Assembly Programme, Assembly Programme, Co-Curricular Activities etc) and infusion of values and teachable moments in all aspects of school life.

One way to evaluate if the programmes are effective in inculcating the values and SE Competencies in the students is to assess their leaning. In this project, the Social Emotional Competency Inventory developed locally by Guidance Branch, Ministry of Education(MOE)

was used as a tool for Secondary 2E1 to self-assess their level of SEL. Lessons were then designed to address SE Competencies in which the class scored lowest in the SEC Inventory. To ensure clarity in the expected outcomes of the lessons, the SOLO Taxonomy is used as a guide in the design of the rubrics in the lesson. A post-test was conducted to see if the teaching of SE related skills would help create greater awareness of the students' SE skills.

Literature Review

Reicher (2009) states that it is necessary to provide SEL interventions within supportive learning environments, which may also be directed at enhancing the social-emotional environmental factors that influence learning. In our project, the use of appropriate voice tones to aid in relationship management helps the students to create a supportive learning environment for their academic and future learning. Elias (2003) suggests that it is imperative that SEL programme selection require careful consideration of needs, which we use in our methodology to narrow down the skills of focus. Using the SEC Inventory as a tool, we are also able to accomplish Elia's recommendation of monitoring SEL efforts regularly to ensure programme effectiveness.

Tan (2013) raised the importance of having clarity in the standards during the design of the assessment and effective feedback is key to bridging the gaps in learning. In this study, the use of the SEC Inventory together with the rubrics based on the principles of SOLO Taxonomy attempts to bring about the clarity of the standards expected and lessons are designed to bridge the gaps identified by the SEC Inventory.

Methodology

Our secondary 2 Express stream students completed a pre-test using the SEC inventory via the Sketches App developed by Guidance Branch (MOE). The pre-test used the SEC Inventory as a tool for students to self-assess their ability in SEL via their response to 80 inventory statements. By comparing their responses to a 2014 base of national data provided by Guidance Branch, we evaluated the learning needs of the students in the specific strands of socio-emotional learning. The class scored higher percentages of students in the first quartile (lower end) in two strands: responsible decision making (RDM), 45% and relationship management (RM), 38% as compared to 31% for Social Awareness, Self-management, 24% and Self-Awareness 24%. Based on the needs of the students, one of the strands RM was chosen as an intervention area for this project.

Figure 1 shows how the SE Benchmarks of RM are mapped to specific skills which can be used to bridge the gaps in the identified weaker strands (as shared by Guidance Branch, MOE).

Relationship Management	Skills in relation to the Relationship Management
Benchmark 10 2.2.3b/2.2.4b Use communication and interpersonal skills to build relationships and to effectively manage challenges in relationships	✓ Active listening skills ✓ Observation of nonverbal cues in communication ✓ Communicating one's thinking and feeling accurately

Figure 1

Based on the observation from the Form Teachers', conflicts tended to arise due to misunderstanding arising from inappropriate voice tone. One student shared in her reflection, "at the end of the day, I tire easily. Sometimes when my friends talk to me, I a sound annoyed or angry, although I felt none of these emotion. This affects my friends and they are puzzled and bothered. "

The intervention chosen to bridge the gap in RM is premised on the belief that improving communication skills (in this case teaching appropriate voice tone) would improve the students' skills in RM.

Students were selected for intervention based on their individual reports. Out of a class of 38 students, 8 scored "budding" in the RM competence strand. Hence, they were selected for the intervention lesson.

One CCE lesson was customised for the selected students, with reference to the SEL lesson from the Social Skills Package developed by Guidance Branch. In the lesson, students were taught how to use appropriate voice tone through a 4 step procedure. Part of the Guidance Branch lesson was customised to allow students to contextualize the learning to their personal experiences of how appropriate voice tone affected relationships with others (family, peers and adults in school). The other adaptation made was for students to reflect on their experiences guided by a rubric developed based on the principles of SOLO Taxonomy in Figure 2: The rubric was shared with the students, followed by the students writing their reflection based on the rubric (Figure 2) which stated clearly the expectation of how they could apply the steps of appropriate voice tone to improve their relationship with others. Circle pedagogy was used to engage and allow for student voices.

Criteria	Need more effort	Satisfactory	Good	Excellent
Describe a situation where you experienced the use of inappropriate tone of voice. How were you or others affected? Describe what could be done to make things right.				
Reflection shows ability to: • Identify what is the appropriate use of voice tone • Understand that appropriate use of voice tone will affect communication and relationships	Able to reproduce to steps of appropriate voice tone without elaboration	Able to describe the steps of appropriate voice tone without relating to the context of the situation	Able to analyse the issues using appropriate voice tone to communicate and able to take perspectives of the different parties involved to build positive relationships	Able to analyse the issues using appropriate voice tone to communicate, take perspective to build positive relationships and influence others to do likewise.

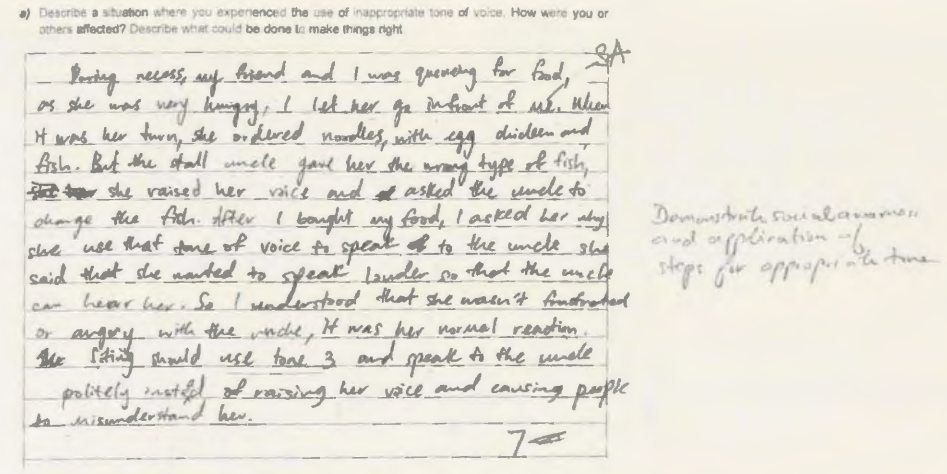
Figure 2

With the rubric being shared with the students, the students become aware of the skills needed to help them have appropriate voice tone and hence improvement their competency to better manage relationships (See sample reflection in Figure 3). In understanding the rubric, students realised that knowing the steps of appropriate voice tone is insufficient, there is a need to apply it to a context (multistructural) and be able to analyse and take perspective of how others are affected by their tone of voice (relational) and eventually to be able to be a positive influence to others to use the appropriate voice tone (extended abstract).

Results and Discussion

Before the lesson, students were asked to indicate if they felt there was a need to improve on relationship management. 7 out of 8 students gave a positive response. The lesson introduced the concept of how voice tone can affect relationships positively or negatively. Students then shared personal anecdotes on how they and others were affected by inappropriate voice tones. At the end of the lesson, the students did a reflection which was crafted with the SOLO rubrics as a guide (Figure 2). Out of a total score of 10, 4 students scored 5, 1 scored 6, and 3 scored 7 (See Figure 3 for a sample of a student's reflection).

The students were generally more aware of the impact of the use of appropriate voice tones to build positive relationships. For example, students demonstrated that they had the ability to take multiple perspectives such as identifying emotions or social cues. At the end of the lesson, 6 out of 8 students responded positively that the lesson enabled them to become more aware of the use of appropriate voice tone to communicate better with others.


a) Describe a situation where you experienced the use of inappropriate tone of voice. How were you or others affected? Describe what could be done to make things right

During recess, my friend and I was queuing for food, as she was very hungry, I let her go infront of me. When it was her turn, she ordered noodles, with egg drizzen and fish. But the stall uncle gave her the wrong type of fish, ~~then~~ she raised her voice and ~~at~~ asked the uncle to change the fish. After I bought my food, I asked her why she use that tone of voice to speak ~~at~~ to the uncle she said that she wanted to speak louder so that the uncle can hear her. So I understood that she wasn't frustrated or angery with the uncle, it was her normal reaction. She ~~is~~ should use tone 3 and speak to the uncle politely instead of raising her voice and causing people to misunderstand her.

7

Demonstrate social awareness and application of steps for appropriate tone

Figure 3

Upon reflection, the SEC Inventory results coincided with anecdotal evidence from Form Teachers and subject teachers with regard to the relationship management skills of these students. From these results, we find that the SEC Inventory is useful in identifying specific SE needs of students for early intervention, rather than to wait until issues escalate into disciplinary issues and inter-personal conflicts.

Conclusion

We are acutely aware that CCE lessons and programmes in school is not a panacea, however, efforts must still be made to assess the SE needs of the students so that gaps in their learning can be addressed via well-planned CCE lessons and programmes so that they can bring these skills into their lives beyond school to students who will be caring and contributing citizens.

References

Ministry of Education. (2017, June 25). Social and Emotional Learning. Retrieved from https://www.moe.gov.sg/education/programmes/social-and-emotional-learning

Reicher, H. (2010). Building inclusive education on social and emotional learning: challenges and perspectives–a review. *International Journal of Inclusive Education, 14*(3), 213-246.

Tan, K. (2013). A Framework for Assessment for Learning: Implications for Feedback Practices within and beyond the Gap. ISRN Education, 2013.

TEACH-BITS 2017

A bi-weekly publication from the Senior Mentor Council

The Four Levels of Feedback and its timing

Teach-Bits Volume 1

The school has started our Assessment Literacy Journey since 2014. This is a year to deepen our practice through the use of Structure of Observed Learning Outcome (SOLO) taxonomy and Four Levels of Feedback. In this Teach-Bits, the school Senior Mentor Council will share the relationship between timing of feedback with the four levels of feedback.

What research says about the timing of feedback

Levels of Feedback	**Timings of Feedback**
Self/personal	
Task	Immediate feedback*
Process	Delayed feedback**
Self-regulated	

*Research finding 1: Immediate feedback on *error* can result on faster rate of acquisition.

**Research finding2: *Difficult* tasks are more likely to involve greater degrees of processing about the task and delayed feedback provides the opportunities for students to do this.

What does it mean for us in the classroom?

"Misconception or error to a *simple* task should be pointed out immediately. Allowing students to continue with the misconceptions as they move on to more complex task can lead to confusion and frustration." – Mr Ng J Y

"Nowadays, students like to ask me for affirmation of their answers [task level feedback] before they even try to complete writing an essay. I always encourage them to finish it up first [delayed feedback] before I provide them with any feedback [at the process level]. The intention is for students to better process the learning through applying the skills in context. Allowing room for practice helps to internalise the skills taught."

- Mrs Linda

"A delay by a few seconds before we give feedback can be powerful as it allows the students to think more about the task. Don't rush into explaining the task too soon."

-Mr Djohan

"When it comes to solving difficult Mathematic problems that require the students to apply the right concepts, it is important that the teacher focuses on not how to solve the problem but the process of selecting the right strategies to solve it. Such process feedback should be given at an appropriate time" - Ms Nai C Y

TEACH-BITS 2017

A bi-weekly publication from the Senior Mentor Council

'Have you ever wondered why some students simply do not respond to your feedback? Find out why?'

The effectiveness of Positive and Negative feedback at the self/personal and task level

Teach-Bits Volume 2

In the last publication, we shared about how immediate and delayed feedback can be more effective at the different levels of feedback. In the article, Mr Terrance Ong from SMC shared what research says about the effectiveness of positive and negative feedback at the self/personal and task level.

The purpose of feedback

The purpose of feedback is to reduce the gap between current and desired understanding, that is for *improvement*.

Effective feedback must answer to three questions:

1. Where am I going? (The goal)
2. How am I going? (The progress, the procedure)
3. What is next? (The possibility)

That is to say, the teacher must to follow up with the students after giving feedback to see if the students have improved.

'Constructive feedback [positive or negative] is information that helps students to improve. They can proceed with the task by themselves and know their mistakes. For example, when an art work produced by pencil drawing lacks contrast [goal is to achieve contrast], feedback given can be on how to create shadows and highlights by using darker pencils [the procedure].

Positive feedback is evident when the students see for themselves their improved work or when their peers comment, "Wow, it looks a lot better now." ' -Ms Arion Lai

However, students may not improve after feedback is given, So what could be the cause of ineffective feedback?

Both positive and negative self/personal feedback is ineffective

Most teachers will think that students ought to close the gap by moving towards the desired goal. However, ineffective feedback could either result in discouraging the students and causing them to stop improving, thereby rendering their learning stagnant, or it could also cause the students to lower their standard by deciding on less challenging goal for themselves.

'One good example is positive feedback at the self/personal level such as "Good work". The student will think that that's is enough and stop improving from there.

An example of negative feedback at the self/personal level is "lousy work, redo". Such feedback is not only ineffective in helping the student to close the gap, it could also demotivate the student. The reason is that the student does not know what makes the piece of work "lousy" and how to redo.

Therefore, feedback (whether positive or negative) at the self/personal level has to be *accompanied by task feedback* to be effective.'

- Mr Terrance Ong

TEACH-BITS 2017

A bi-weekly publication from the Senior Mentor Council

The effectiveness of Positive and Negative feedback at the self-regulated level

Teach-Bits Volume 3

In the last publication, we shared about how positive feedback and negative can be more effective when accompanied by task feedback. at the different levels of feedback. Let recap by watching the video to see how self feedback is accompanied by task feedback and process feedback. Do you think the students have closed their gap of understanding?

Positive or negative self-regulated feedback, which is more effective?

Self-regulated feedback can be understood as information given to help students make judgement of their own work with the intent to close the understanding gap as well as stimulate the willingness to invest more effort in their work. This type of feedback information includes how the students can better monitor their work, how they can detect and correct their own mistakes and how they can seek help. Such information accompanied by task feedback could result in students being more willing to invest more effort to the task, provided that the delivery of these pieces of feedback takes into consideration individual student's *motivation* and *expert level*.

When we talk about *motivation*, we mean that they are motivated to work due to fear (have to do) or hope (want to do). Research showed that for people who are motivated by fear, negative feedback is more effective to help them regulate their learning whereas for students who are motivated by hope, positive feedback is more effective. Teachers therefore, need to be mindful of what motivates the students if they want them to invest more effort in their work. By *expert level*, we mean if the students are functioning at the high level of attainment or are still struggling with the basics. Negative feedback is thus more effective to stretch students and push them towards higher heights. Novice will require positive feedback to get them willing to invest more effort in the task and progress.

'Positive self-regulated feedback is effective in increasing motivation of students who want to do the task. As for students who have to do the task I believe it is more important to first rationalise with them why the task has to be completed [that is, to move them from 'fear' to 'hope']. If it still does not shift their thinking, the way to go is to focus on giving feedback on tasks and processes. That way, the task will still be completed and the student may have a chance to change his/hers thinking as he/she carries out the task [that is, after increased expertise].

- Ms Syakinah

TEACH-BITS 2017
A bi-weekly publication from the Senior Mentor Council

Positive teacher-student relationship

What does it take to connect with our students? In this article, Mdm Kavitha will be sharing how she connects with her Normal Technical students with citations from research work done by Hattie and Yates on 'teacher-student relationship'.

Spending quality and quantity time with our students.

It's just not enough to be with our students in the classroom. We would not be able to get to know them well personally or find out more about their home backgrounds. Time spent outside the classroom is very essential for this. "The quality of teacher-student relationships depends on how much time teachers interact with individual students in a non-coercive and friendly manner". Thus, additional effort and time is needed to discuss their family issues, offering them alternative viewpoints and suggestions. We also connect with them through What's App and get them little tokens of appreciation each time they exhibit good character and good academic progress. 'Every child needs a significant adult to express positive regard in him or her'.

We might never be able to understand the trauma these young children went through simply because we might have had a better childhood. We need to close the gap to connect with them.

"An empathy gap occurs when people are relatively unable to put themselves in the place of another person. When one is warm and secure, it is difficult to conceive of another person's pain and insecurities." Communicate with the students openly, *listen* to their needs carefully and do things they like together.

Teach our students by being a strong moral role

Most of these students did not and still do not have permanent and sensible adult models in their lives. We must take on the task of pointing out and explaining to them through stories and moral values what is right and wrong.

This needs patience and time, as we are patching up holes made in their childhood. "Left to themselves, adolescents often display poor judgement in areas such as social responsibility, risk management and future planning."

We as teachers must show them, through our actions, that caring for others and avoiding selfishness can benefit them in future. Our everyday actions would teach the students what positive and accepted behaviour is. Students emulate our actions and values, just by observing us - what we do, how we speak and whether we keep our words. They know which teacher is truly sincere and affectionate towards them. "Although the behaviours are subtle, implicit and seemingly invisible, their influence on students is intense".

Encourage kids to practise appreciation and gratitude

When children learn to appreciate people who have contributed to their lives, they soon learn not to upset themselves with their negative words. My students are taught how to write out thank you cards to thank their teachers, their mums and the school assistants. I also teach them to empathise and show care to their classmates. We have visited as a class a pupil's hospitalized grandmother. A group of them take their classmates to cut their hair when those pupils spot long unkempt hair. In these ways, the students are constantly reminded to look out for each other. They see each other as member of a family.

In conclusion, our pupils are a reflection of ourselves, our values and our beliefs. A disunited, individualistic lot of students would merely mean our efforts are insufficient in putting them in the right places.

TEACH-BITS 2017
A bi-weekly publication from the Senior Mentor Council

Feedback in the classroom

In the earlier articles, research findings about effectiveness of feedback were shared. In this article, Mrs Linda Wee will be sharing with us Hattie and Timperley's research work on the factors that influence how students will respond to our feedback

Classroom climate that promotes learning from mistakes

Classroom climate is critical, especially for negative feedback to be welcomed and used by students. An evaluative classroom climate where students are expected to give the right answer will reduce students' motivation and engagement.

Student engagement in learning is likely to be constrained by the evaluative dimensions of classroom lessons because there is personal risk involved in responding publicly and failing. (p.100)

Errors and disconfirmation are most powerful in climates in which they are seen as leading to future learning. Also, when learners interpret feedback as an attempt to control them or tell them how they *should* be doing something rather than guidance on how to improve, they can become disengaged.

Students' ownership in seeking feedback

Teachers need to view feedback from the perspective of the individual student engaged in the learning and become proactive in providing information addressing the three feedback questions: "How am I going?", "Where to next?" and "Where am I going?" and developing ways for students to ask these questions of themselves. (p.101)

This is to change students' perception that feedback is the responsibility of others and not of themselves. Teacher could provide opportunities such as self/peer assessment using rubrics, checklists and feedback conversations where information on how to improve are exchanged and clarified among students or between teacher and individual student.

This will in turn improve students' self-efficacy in learning when they take the ownership in seeking feedback.

Gender biasness in feedback

Teachers need to be mindful of how comments are often made in the classroom. Teacher feedback to boys are often more related to lack of effort or poor behaviour and to girls are often more about ability attributions. Such feedback is at the self/personal level and has little effect on students' improvement in term of closing the learning gap. To compound the problem, such "fixed mindset" feedback could provide students with the thinking that inherent ability is more important than the effort/commitment to succeed.

Cultural background of the students

Feedback is not only differentially given, but also differentially received. For example, students from collectivist cultures (e.g. Asia) prefer indirect, group-focused feedback, but those from individualistic cultures (e.g. US) prefer more direct, individual-focused self-related feedback. Thus, teachers can strike a balance between the two types of feedback in a multi-cultural classroom.

In conclusion, teachers need to focus not just on how feedback is given but the factors that would interfere with how students respond to feedback. When teachers pause to understand why students responded in a certain way (whether positively or negatively), they will be able to build on the given factors suggested by research. This will in turn make them a more effective teacher.

Reference: Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of educational research*, *77*(1), 81-112.

Editorial Team

Comprises members of Senior Mentor Council (SMC)

Editor-in-Chief
Mr Lawrence Lim Boon Huat
School Staff Developer

Assistant Editor
Mr Ng Joon Yong
Head of Department, Craft and Technology

Designer
Mr Mohammad Zabid Jabar

Editors
Mr Djohan Abdul Rahman
Lead Teacher (Malay Language)
Chairperson, SMC

Mrs Linda Wee-Soh Suay Hung
Lead Teacher (Social Studies)
Vice Chairperson, SMC

Mr Terrence Ong Yong Wee
Head of Department, Mother Tongue Language

Mrs Hsu Lay Keok
Senior Teacher (Science)

Ms Nai Chheu Yee
Senior Teacher (Mathematics)

Mdm Kavitha Kanniah

Ms Li Ying

In addition, the following Heads of Department also rendered their support:

Mrs Khet-Hoo Yiin Hwa
Head of Department, Mathematics

Mr Mathi Vanan
Head of Department, Information and Communication Technologies

Ms Diana Chua May Ling
Head of Department, English Language

Acknowledgement

Mdm Valerie Goh Mien Hui
Principal

Mr Kenneth Sim Kok Hian
Vice Principal

Mrs Esther Chee-Lee Chui Eng
Vice Principal

Bishan Park Secondary School